



Amtrak Five Year **Infrastructure Asset Line Plan**

Base (FY 2019) + Five Year Strategic Plan (FY 2020–2024)



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Ready to Build: Susquehanna River Bridge – Location Connecting Perryville and Havre de Grace, MD.



Ready to Build: Portal North Bridge – Location Connecting Kearny and Secaucus, NJ.

Summary

The 2019 Infrastructure Asset Line Plan ([IALP2019](#)) builds on our 2017 asset management plan (I-AMP2017) and fulfills the requirements for asset plans set forth in section 11203(c) of the Fixing America's Surface Transportation (FAST) Act, codified at 49 U.S.C. § 24320(c); as well as requirements for NEC Infrastructure Asset Management Plans codified at 49 U.S.C § 24904(c).

[Amtrak](#) is the nation's federally-chartered intercity passenger rail operator and infrastructure provider. With safety as the highest priority, we aim to provide efficient and effective transportation that is trip-time competitive with other intercity travel options.

Amtrak owns 2,408 track miles of infrastructure of which 1,169 track miles are the NEC main line providing infrastructure for approximately 820,000 trips daily.

After decades of underinvestment Amtrak's aging infrastructure is struggling to keep pace with increased demand. While we achieve safe operation each and every day, the reliability of our track, bridges and buildings (B&B), electric traction (ET), and communications and signals (C&S) assets is declining, and our ongoing ability to meet performance targets is increasingly challenging.

Based on current funding levels, the Steady State shortfall will

Our State of Good Repair (SOGR) Backlog for Infrastructure is

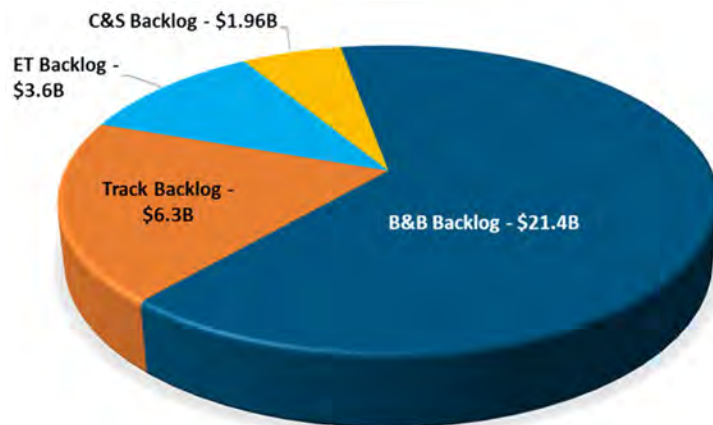
FY19 to FY24 Steady State and SOGR Backlog program shortfall

Our Challenge

Our State of Good Repair (SOGR) Backlog – the assets that have been assessed as at or nearing the end of their useful lives – is significant and is estimated to be **over \$33.3 Billion** – with **\$28.1 Billion on Amtrak’s portion of the NEC Corridor**.

Steady State Capital Replacement

A principal goal of Amtrak Engineering is to transition to normalized, or steady state levels of capital maintenance, necessary to maintain SOGR. Our analysis suggests the steady state program requires an estimated \$1.2 Billion annually. This is a \$0.53 Billion increase over the current FY2019 authorized capital plan for infrastructure (Amtrak Engineering received \$0.826 Billion for FY19, of which \$0.668 Billion is for infrastructure projects). Without significant change to current investment levels the shortfall will continue to grow. With our forecast program - our analysis suggests this could be over \$4.3 billion by 2024.



State of Good Repair Backlog

To have an effective and efficient Steady State program, Amtrak Engineering must first bring our infrastructure assets to a SOGR. SOGR means that our assets perform safely, as designed, within their estimated service lives. The ability to maintain infrastructure assets in SOGR with a steady state maintenance approach is only possible if the assets are first brought to SOGR.

Amtrak Engineering has assessed the **SOGR backlog at \$33.3 billion** for infrastructure nationally. Given the advancing age of the infrastructure, historical underinvestment and the precipitous end of life facing major asset classes Amtrak Engineering have set a target of ten years to eliminate the SOGR backlog.

While achieving a 10-year schedule for all asset types would likely require more support resources (manpower, equipment and track outages) than are realistically available, Amtrak is confident that some assets such as Track, can be accomplished in this period if adequate funding is available. Additionally, we’ve set this aggressive goal because the longer we delay our SOGR efforts, the greater the gap to steady state and risk to reliable service for our customers.

be over \$4.3 Billion by 2024.

estimated to be \$33.3 Billion

estimated to be \$21.9 Billion

Our Plan

This 10-year SOGR strategy now allows us to define the funding requirements. As a result of this analysis, we have determined we will require **\$3.33 billion per year to address SOGR across all the asset categories in this 10-year window**. When assessing our forecast FY2019 to FY2024 capital funding there is a \$17.6 billion shortfall in funding to begin to address SOGR.

It should be acknowledged, however, that the amount to address SOGR backlog is in addition to the necessary \$1.2 billion annual steady state investment required to prevent further infrastructure deterioration. Therefore, the backlog over the 6-year planning period to transition to SOGR is **\$21.9 billion**.

Our current infrastructure budget would never achieve SOGR across all assets.

If full funding to achieve SOGR were available, Amtrak Engineering and Operations would be able to provide a complete analysis for the resource levels needed to deliver this work. Certain events, such as track outages, would enable construction and maintenance. But, they

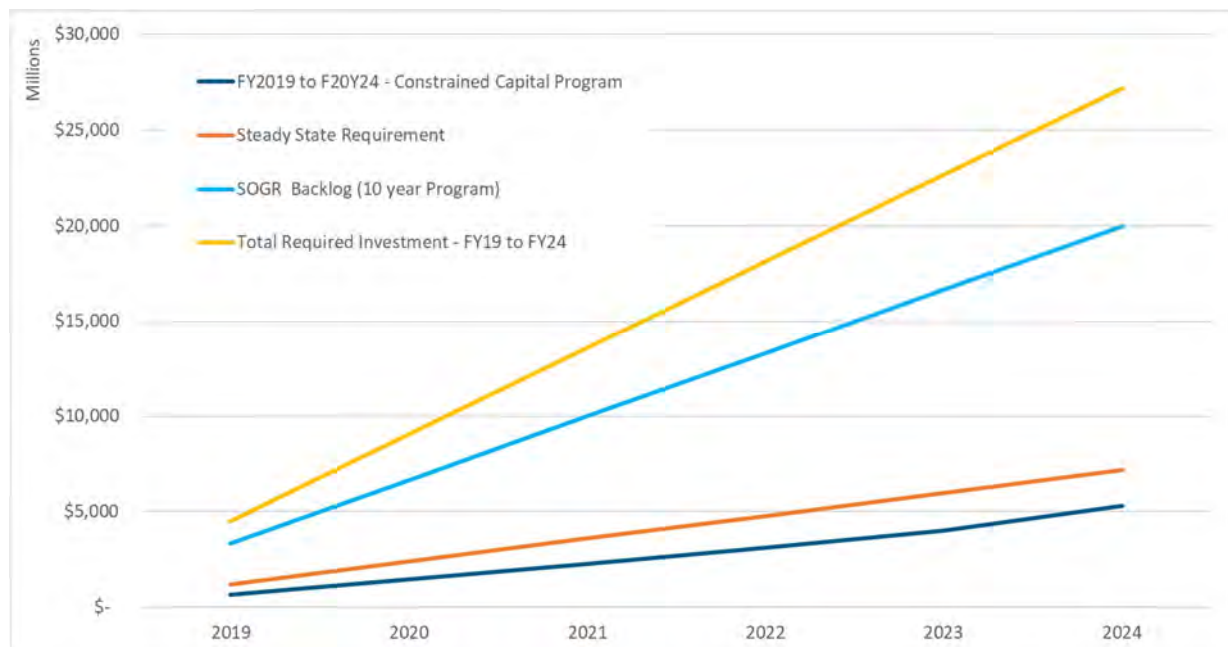
also would limit train operations. Operators that use Amtrak's assets (including Amtrak) would need to develop a joint work plan if we are to maintain desired service levels.

This plan could cover more than 10 years or accelerate other work that does not involve these resources

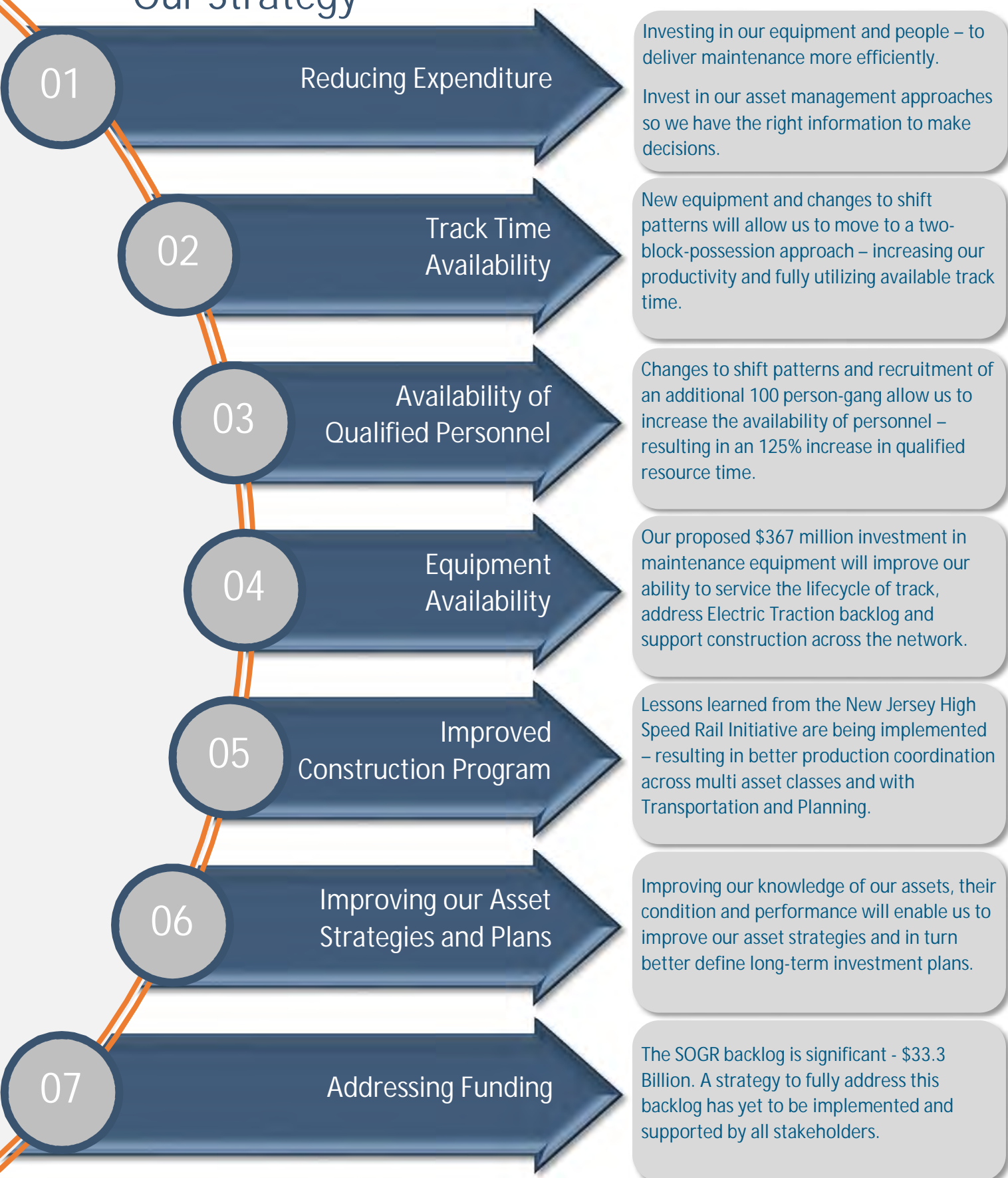
Infrastructure Capital Program

Our constrained and prioritized list of infrastructure capital projects for FY2019 to FY2024 is included in [appendix H](#). The capital budget is set on an annual basis. Our plan therefore considers funding levels authorized or otherwise available to Amtrak in FY2019 and forecast available funding in FY2020 through FY2024. It should be acknowledged that, at the time of publication, the FY2019 plan is under way.

A comparison of our constrained capital program against normalized steady state levels of investment and the investment needed to address SOGR backlog is shown below.



Our Strategy



Introduction

The 2019 Infrastructure Asset Line Plan ([IALP2019](#)) builds on our 2017 asset management plan (I-AMP2017) and fulfills the requirements for asset plans set forth in section 11203(c) of the Fixing America's Surface Transportation (FAST) Act, codified at 49 U.S.C. § 24320(c); as well as requirements for NEC Infrastructure Asset Management Plans codified at 49 U.S.C § 24904(c).

Overview

Amtrak—America's Railroad—is dedicated to safe and reliable mobility as the nation's intercity passenger rail service provider and its high-speed rail operator. The infrastructure we own and maintain is largely located in the northeast – including 1,169 track miles of main-line on the Northeast Corridor (NEC) line between Washington, DC, and New Rochelle, NY and between New Haven, CT and the Rhode Island-Massachusetts border. Our infrastructure on the NEC is used by over 2,100 passenger trains and 60 freight trains each day, at speeds up to 150 mph (241 kph). We own infrastructure across the nation, as well as managing infrastructure on behalf of the States of Michigan and New York. We provide efficient and effective intercity passenger rail mobility, connecting more than 500 destinations in 46 states that is trip-time competitive with other intercity travel options.

However, after decades of underinvestment Amtrak's aging infrastructure is struggling to keep pace with increased demand. While we achieve safe

operation each and every day, the reliability of our track, bridges and buildings (B&B), electric traction (ET), and communications and signals (C&S) assets is declining, and our ongoing ability to meet performance targets is increasingly challenging.

Acknowledging the challenges we face and the extent of the backlog of urgent capital investment, this Infrastructure Asset Line Plan sets out the lifecycle strategies and establishes the necessary work bank to better manage Amtrak's infrastructure – nationally. It identifies the state of good repair backlog requiring urgent attention. It establishes the normalized or steady state activities necessary to sustain the assets in a state of good repair and ensure that infrastructure assets are functional and able to continue to support a safe, efficient and sustainable national rail network.

Responsible Officials

Pursuant to 49 CFR § 625.5 (as required in 49 U.S.C § 24904) the Accountable Executive with responsibility for carrying out infrastructure asset management practices is:

- Amtrak Engineering: Gerhard Williams, Vice President Chief Engineer

Pursuant to 49 U.S.C. § 24320(c)(3)(c) the following individuals are responsible for Amtrak owned and/or managed assets in each asset category (referred to as the Asset Manager):

- Track Infrastructure assets: Steven Humes, Deputy Chief Engineer Track
- Bridges and Buildings assets: Paul DelSignore, Deputy Chief Engineer Structures
- Electric Traction assets: Eric F. Hornung, Deputy Chief Engineer Electric Traction
- Communications and Signals assets: Nicholas J. Croce, Deputy Chief Engineer Communications and Signals
- Equipment assets: William Bates, Senior Director Business Improvement

Objectives

This [Infrastructure Asset Line Plan \(IALP2019\)](#) builds on the 2017 Asset Management Plan. Its scope is extended to include both the NEC infrastructure as well as infrastructure owned and/or managed by Amtrak nationally.

The plan satisfies US Federal FAST Act requirements for asset plans – 49 U.S.C § 24320(c) – as follows:

- Asset Performance: documents service level requirements and how we propose managing and monitoring performance.
- Asset Inventory: summarizes the NEC and national infrastructure assets – including type,

extent, age, condition and information on ownership.

- Strategic Plans: establishes a strategic plan for each asset class that lays out the goals, objectives, any relevant performance metrics, and statute requirements or regulatory actions affecting the assets. It also establishes the lifecycle management strategies necessary to move to normalized or steady state lifecycle replacement.
- Prioritized Investments: documents the current 2019 capital investment plan and the forecast 2020 to 2024 five-year capital program including FAST Act categories, business outcomes, costs and benefits. [Appendix H](#) provides the [Constrained Infrastructure Capital Investment Program for FY2019 to FY2024](#).
- Unfunded Needs: establishes the unfunded needs based on assessment of the infrastructure state of good repair (SOGR) backlog and production rates necessary for normalized or steady state replacement. [Appendix I](#) provides the [Unconstrained Capital Investment program for Infrastructure](#). In addition, the [Asset Class Appendices B-F](#) provide assessments of [unfunded steady state and SOGR backlog requirements](#).

In addition, [appendix A sets out our Asset Management Plan](#) – satisfying US Federal FAST Act requirements for an asset management plan – 49 U.S.C § 24904 – as follows:

- Asset Management Policy: states the guiding principles by which Amtrak implements its asset management capabilities.
- Asset Management Practices: documents the key processes, organization and technology tools that enable effective infrastructure management.
- Improvement Plan: establishes action plans for improving Amtrak's approach to asset management activities.

Alignment to Amtrak's Strategic Pillars

In 2018 the Amtrak Board of Directors and the new Executive Leadership Team introduced six strategic pillars that define the long-term initiatives we must pursue to deliver world-class safety, service, and value. These pillars are as follows:

1. Excellence in safety and operations that results in the highest levels of safety in the passenger rail industry.
2. Positive customer impact that focuses on improving the travel experiences for all our customers.
3. Integrated strategy to provide longer-term direction.
4. Invest in our assets to maximize reliability and lifetime.
5. Invest in our people to build a more collaborative team-oriented culture that balances speed, agility, and control.
6. Excellence in financial stewardship that improves efficiencies and maximizes the public's investment.

Amtrak's investment in its infrastructure assets is a key tool for implementing its strategic pillars. The matrix in Figure 1 highlights the relationship between the six strategic pillars and the categories in our capital investment plan.

Further information on FAST Act Capital Project Categorization is presented in [Appendix H](#).

Figure 1: Relationship between Amtrak's Strategic Pillars and the Categories of Projects in this Asset Line Plan.

FAST Act Category	Amtrak Strategic Pillars					
	Excellence in Safety and Operations	Positive Customer Impact	Integrated Strategy	Invest in our Assets	Invest in our People	Excellence in Financial Stewardship
Normalized Capital Replacement	✓	✓	✓	✓		✓
Backlog Capital Replacement	✓	✓		✓		
Improvements to support service enhancements or growth		✓	✓	✓		
Strategic Initiatives	✓		✓		✓	✓
Statutory, regulatory or other legal mandates	✓	✓		✓	✓	

Scope of this Asset Line Plan

The scope of this plan is the infrastructure owned and/or managed by Amtrak: track, communications, signals, electric traction, bridges and buildings, and equipment assets.

Nationally, Amtrak is responsible for 2,408 track miles of infrastructure that is used by both Amtrak Transportation and other users, including commuter rail and freight rail. Table 1 provides a summary of infrastructure owned and/or managed by Amtrak, further detail is provided in the [Asset Inventory](#) section and in the asset class strategies in the appendices.

Definition of the Northeast Corridor

The branch lines are part of the Northeast Corridor (NEC) in several contexts, including being subject to capital planning and cost allocation provisions of Section 11306 of the FAST Act and Section 212, codified at 49 U.S.C. § 24904 and § 24905. Some statutory and other definitions of the NEC also include the New York, NY-Albany, NY line (Hudson Line) and the Washington, DC-Richmond, VA line.

For the purposes of IALP2019, the NEC main line is defined as the Washington–Boston route, which is consistent with our Five-Year Service Line Plans. We have separated the NEC branch lines into their own category.

Table 1: Scope of Infrastructure Asset Plan – Summary

Northeast Corridor Main Line	Northeast Corridor Branch Lines	National Rail Network
Owned, Operated and Managed by Amtrak		
→ 1,169 track miles of infrastructures along the northeast corridor main-line	→ 262 track miles of infrastructure on the Harrisburg Line → 108 track miles of infrastructure on the Springfield Line → 19 track miles of infrastructure on the West Side Connection → 12 track miles of infrastructure on the Post Road Branch	→ 96 track miles of infrastructure on the Michigan Line → Yard tracks in Miami, Chicago, Los Angeles, New Orleans, New York City, Oakland (Kirkham Street Yard), Orlando, Portland, Saint Paul, Seattle, and Washington, D.C.
Owned by Others, Operated and Managed by Amtrak		
→ N/A	→ 78 track miles of infrastructure on the Empire Line leased from CSX and funded by the State of New York.	→ 182 track miles of infrastructure on the Michigan line owned by the State of Michigan.
Changes in infrastructure from 2017		
→ In 2018 Amtrak ceased maintenance on the 82 track miles of Massachusetts Bay Transportation Authority (MBTA) owned NEC infrastructure between Boston and the Rhode Island state line, known locally as the Attleboro Line (accounted for in above).	→ Additional 19.5 track miles of main-line track added to Springfield as part of the double track program (accounted for in above)	→ No changes

All distances are in track miles of mainline only and rounded to nearest mile.

Plan Structure

Figure 2: Asset Line Plan – Summary Outline



Relationship to Other Documents

IALP2019 documents Amtrak's Infrastructure Asset Management Framework, and establishes the maintenance, overhaul and renewal strategies for all Amtrak owned or managed infrastructure assets. The plan is aligned to and consistent with multiple Amtrak and other stakeholder documents:

- Amtrak Five-Year Service Line Plans (Base (FY2018) + Five Year Strategic Plan (FY2019-2023)). These strategic plans for each key element of Amtrak's business fulfill our statutory planning requirement set forth in 49 U.S.C § 24320(b). These plans set the goals and objectives to which we have aligned IALP2019.
- Amtrak Infrastructure Asset Management Plan 2017. Under FAST Act (U.S.C. 24904), Amtrak must establish an asset management plan for NEC infrastructure, owned and/or managed by Amtrak. The plan has established a baseline and this asset line plan represents the next iteration of our infrastructure planning.
- Sustainability Report – FY2016-FY2017. This report details Amtrak's environmental, financial and social sustainability efforts and provides goals related to asset safety and climate change resiliency initiatives.
- Climate Change Strategy Subcommittee of the Environment & Sustainability Management System (ESMS) Steering Committee. The steering committee identifies and develops initiatives to improve Amtrak's assets and operational resilience. This has included pilot studies and flood inundation mapping.
- Amtrak Engineering Annual Operating Plan FY19. This plan sets out the actions the Engineering Department intends to take to further Amtrak's main goals as outlined in Amtrak's Corporate Plan for FY19.
- NEC FUTURE and Initial Strategic Development Plan (SDP). This is the FRA's comprehensive planning effort to define, evaluate, and prioritize future investments in the NEC. The strategic plan provides direction to the planning effort included in this asset line plan.
- NEC Commuter and Intercity Rail Cost Allocation Policy (as amended March 8, 2018). This policy establishes the Passenger Rail Investment and Improvement Act (PRIIA) 2008, requirements for a cost-sharing arrangement for NEC infrastructure.
- NEC Capital Investment Plan (Fiscal Years 2019 - 2023). This plan documents the investments required over the next five years to reverse decades of deterioration and begin to modernize the NEC for future economic growth. The plan combines anticipated investments based on available funding and resources with capital investments that could occur with additional funding to eliminate the state of good repair backlog and improve performance of the railroad.
- NEC One-Year Implementation Plan: Fiscal Year 2019. This plan is a cross-agency record of the anticipated capital project activity along the corridor in the upcoming federal fiscal year based on available capital funding.
- NEC Future Strategic Development Plan (SDP) Updates. The SDP is a roadmap for implementation of the corridor-wide selected NEC Future Alternative. The SDP defines priority projects, describe strategies to manage resources and construction, and presented a financial strategy for the first phase of improvements.
- New York State Rail Plan. This plan identifies a set of strategies and initiatives to guide planning and investment for the State's passenger and freight rail system for the next 20 years. This relates to the IALP with respect to

infrastructure associated with Amtrak's Empire Service.

- State Rail Plans. These are long-term plans for a given state rail system. Relevant plans are for those states in which Amtrak either owns infrastructure or operates on another owner's infrastructure. These plans guide future development and investments of the state rail system for both passenger and freight rail over the next 10 - 20 years.
- State DOT Capital Plans. These are shorter-term (typically 5 year) programs of infrastructure investments for the state passenger and freight rail. Relevant plans are for those states in which Amtrak either owns infrastructure or operates on another owner's infrastructure.
- Other Planning Documents. Additional planning documents have been used for context only.

Stakeholder Engagement

The FAST Act requires that stakeholders are consulted in the development of the asset line plans. Amtrak engaged both the Federal Railroad Administration and the Northeast Corridor Commission in developing its infrastructure asset line plan. Amtrak will work to improve alignment between the IALP and Commission's Capital Investment Plan (CIP) in the coming years.

This year's IALP reflects Amtrak's pre-existing financial system. However, Amtrak is transitioning its financial system into project-based capital budgets rather than by engineering activity. As a result, Amtrak submissions for the CIP will require less manual adjustment, and alignment between the IALP and the CIP should be much clearer starting in the period covering FY 2021-2025.

Amtrak is looking forward to working with the Commission to develop recommendations for the renewal of the cost allocation policy and FAST Act reauthorization, to improve and streamline planning efforts and to create a more inclusive process for plan development and review.

Changes from I-AMP2017

IALP2019 represents a continued improvement from our 2017 Infrastructure Asset Management Plan. While much of the content is similar in presentation, Table 2 captures the significant differences.

Table 2: Summary of Changes from I-AMP2017

Section	Changes from I-AMP2017
Main-body: Asset Line Plan	
Introduction	Provides a revised planning development, reviewing and monitoring process to align all requirements for asset plans.
Asset and Asset Management Performance	Performance measures introduced to focus on key drivers for asset faults and alignment to our strategic pillars.
Asset Inventory	Includes national assets as well as NEC assets. Other updates reflect recent capital projects and changes in asset ownership.
Constrained Infrastructure Capital Program	Provides constrained summary FY2019 to FY2024 investments. Detail is provided in Appendix H .
Appendix A: Asset Management Plan	
Asset Management Practices	Updated to reflect recent developments – including capital prioritization and planning.
Improvement Plan	Revised improvement roadmap and development action plan.
Appendix B-F: Asset Class Strategies	
Appendices	Updated strategies to progress each asset class towards steady state replacement. Maintenance of way equipment have been added as an appendix.

Continuous Improvement

IALP2019 will be updated, extended and improved in future versions. Key improvement actions - identified through the asset line planning process - are summarized in an improvement roadmap presented in our [Asset Management Plan in appendix A](#). These key improvement actions highlight the steps we will take to ensure that future versions provide improved estimates and evaluation of the work necessary to maintain the national infrastructure network we offer.

Review and Monitoring

This plan is a living document which is relevant and integral to infrastructure activity. To ensure the plan remains useful and relevant, the following on-going monitoring and review activities will be undertaken:

- The Asset Management Policy contained within this plan has been formally adopted by Amtrak top management to direct the development of future asset management initiatives – including future versions of this plan.
- This Infrastructure Asset Line Plan will be formally adopted by Amtrak Engineering and will be used to guide the delivery and monitor performance of maintenance and capital programs across the NEC and national network.
- The Asset and Asset Management Performance section will be further reviewed and developed following changes to the Amtrak Service Line Plans and Service Agreements. Performance targets shall be monitored each period and work plans reviewed as to their ability to deliver the required level of service for each asset class.
- Pursuant to 49 U.S.C § 24320 this plan will undergo a full review and update annually and will be submitted to the FRA on February 15, 2019 and each year thereafter.

Revised Planning Schedule

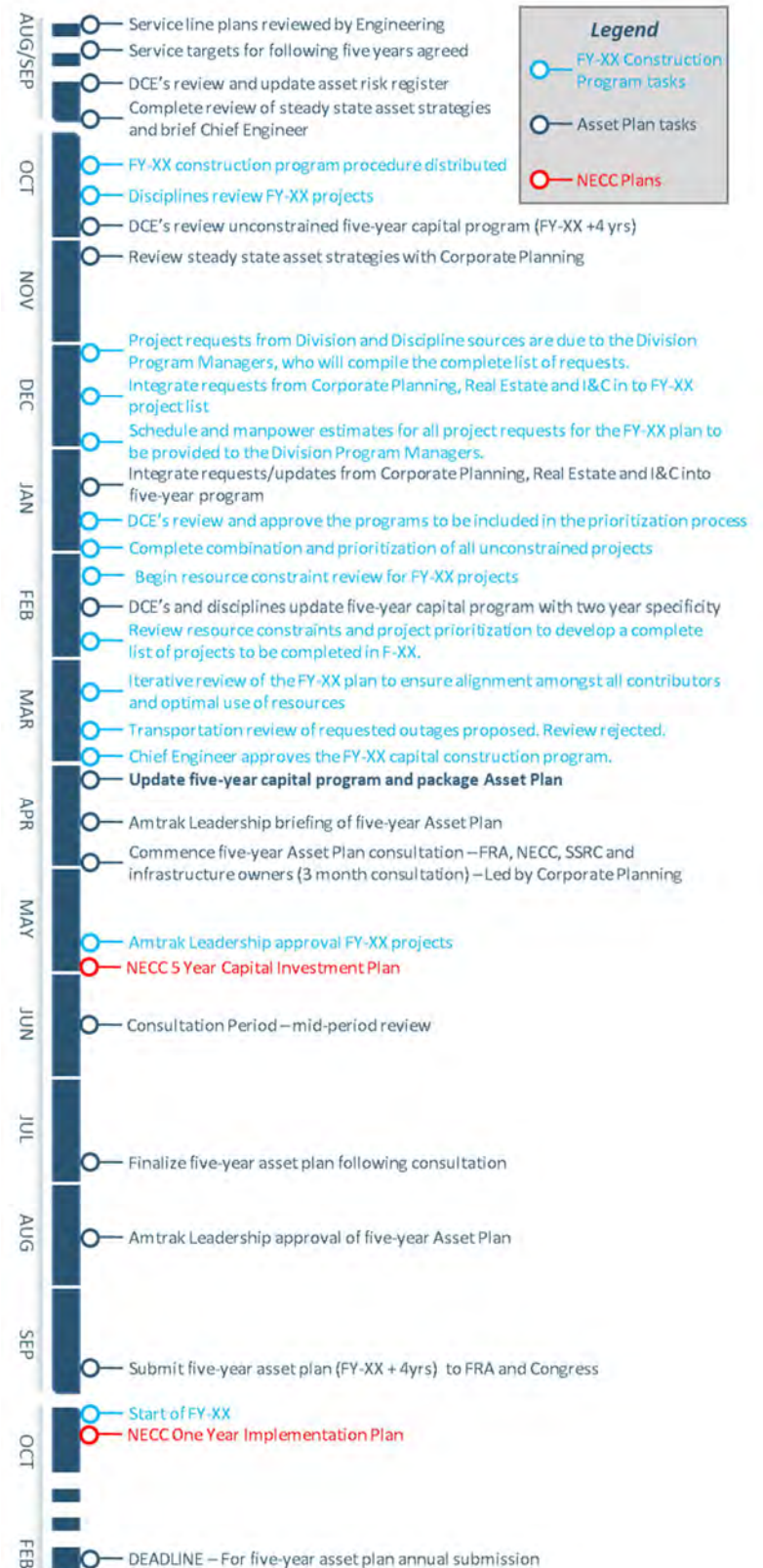
To ensure the asset line plan development process is integrated into capital planning and production (construction) schedule development, Amtrak Engineering has revised the development and delivery schedule for the Infrastructure Asset Line Plan.

The schedule results in an annually updated asset line plan that satisfies US Federal FAST Act requirements for asset plans – 49 U.S.C § 24320(c), as well as US Federal FAST Act requirements for NEC asset management plans – 49 U.S.C § 24904. The schedule is described in Figure 3 and includes:

- Integrated process steps for development of five-year capital program and one-year construction programs.
- [Quarter 1 \(up to Dec\)](#): Focuses on confirming risks, asset strategies and utilizing data to determine a list of unconstrained projects for the one-year construction program.
- [Quarter 2 \(Jan to Mar\)](#): Focuses on finalizing a constrained one-year construction program and increasing project specificity for the following fiscal year.
- [Quarter 3 \(Apr to Jun\)](#): Focuses on seeking and obtaining Amtrak leadership approval of one-year construction program prior to commencing a consultation period (led by Corporate Planning).
- [Quarter 4 \(Jul to Sep\)](#): Focuses on finalizing and publishing the five-year asset plan before the beginning of the new fiscal year (October). The five-year planning period is new fiscal year plus four years.

This cycle integrates the asset plan with Amtrak infrastructure construction program and meets the requirements of 49 U.S.C § 24320(a)(1) – that plans shall be submitted no later than February 15 of each year.

Figure 3: Asset Line Plan - Proposed Development Schedule





Unfunded SOGR Backlog – Bush River Bridge Replacement. NEC.

Asset and Asset Management Performance

Beginning in 2017, Amtrak's Engineering Department introduced a series of revised performance reports to further focus attention on issues that impact our ability to deliver our service line plans. Our actions to address performance and achieve our corporate goals are outlined in the Amtrak Engineering "Annual Operating Plan Delivery FY 2019".

Overview

One of the basic cornerstones of good asset management practice is to align asset management activities with the organizations strategy, thereby ensuring that assets deliver the required levels of service and support strategic goals, efficiently and economically.

Alignment demonstrates the relationship between levels of service and the cost of infrastructure service delivery. In turn, this relationship can be evaluated to:

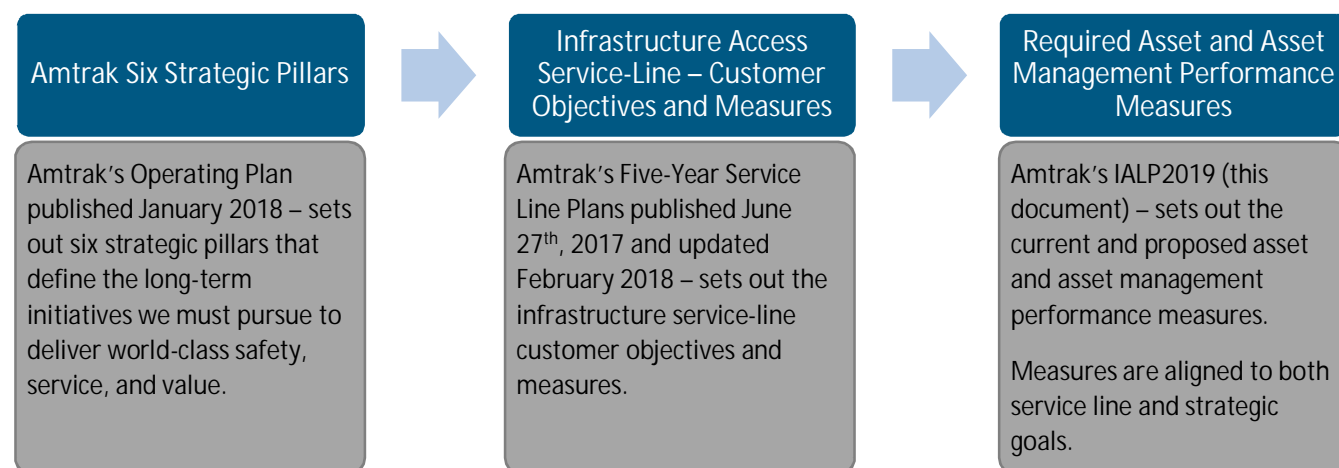
- Determine the affordability of the steady state infrastructure maintenance needed to meet the customer service levels
- Develop asset management strategies and plans to meet required performance targets
- Where necessary, justify additional funding requirements or justify service reductions
- Monitor infrastructure performance to ensure Amtrak continues to meet defined levels of service

For Amtrak, as highlighted in Figure 4, the asset and asset management performance measures are aligned to the six strategic pillars and the service line plans. This approach is consistent with best practice in national and international standards.

Following the recent publication of the [Amtrak Five-Year Service Line Plans](#) Amtrak continues to align asset and asset management performance targets to customer levels of service.

In 2017, Amtrak Engineering revised its performance reports to focus attention on issues that impact our ability to deliver service line plans. The revised approach (see [appendix A – Asset Management Plan](#)) – delivered by the Engineering Operations Desk – sets out what happened, the cause and how it was resolved (referred to as problem-cause-remedy). This information is reviewed to support the introduction of preventive maintenance action on systemic and repeat failures.

Figure 4: Alignment of Corporate Objectives, Customer Objectives, and Asset and Asset Management Performance Measures



Infrastructure Level of Service Requirements

Infrastructure Service Line – Customer Objectives and Measures

Customer levels of service are defined in the Infrastructure Access Service Line (IASL) section – in [Amtrak's Five-Year Service Line Plans](#). The IASL group's fundamental responsibilities are meeting customer expectations related to the use of Amtrak assets; generating and growing revenue from such use; and driving appropriate investments to renew, rebuild and enhance Amtrak's infrastructure to meet present and future service needs.

IASL's service plan summarizes a series of infrastructure service objectives and measures aligned to the six strategic pillars described in the [Introduction](#). For the purposes of alignment, the objectives defined in the 2017 Service Line Plan have continued to be applied. These include:

1. Provide safe and reliable infrastructure for train services.
2. Obtain funding and financing for infrastructure investment.
3. Manage implementation of agreements and adherence to the cost allocation policy.
4. Improve planning and project delivery.
5. Improve network performance.

Infrastructure Level of Services

Asset management planning enables the relationship between levels of service and the cost of service to be determined. For the infrastructure we own and/or manage the required level of service is defined by the passenger and freight operations that utilize available train paths.

On the Northeast Corridor – which represents the majority of Amtrak owned infrastructure, current service levels and equipment will operate through 2021. As part of the Acela 2021 program, new equipment will be introduced in 2022, replacing existing equipment and increasing service with a 24 trainset plan, ramping up to the full 28 trainset service plan.

Across the national network, there are several additional state service initiatives being introduced – which do not impact Amtrak owned and/or managed infrastructure.

Other operators across Amtrak owned and/or managed infrastructure are not expected to have large variance to the current schedules operated during the FY2020 to FY2024 planning period.

Asset and Asset Management Performance Metrics

For 2019, Amtrak Engineering is continuing to review performance metrics to focus attention on both the tactical issues that impact service delivery as well as strategic issues that impact our long-term decision-making ability.

Table 3 and Table 4 present the current and proposed (highlighted in blue) asset and asset management performance measures. Proposed measures are being introduced to address strategic issues that impact our long-term decision-making ability. In addition, these measures are aligned to both FAST Act and PRIIA section 209 requirements. These measures will be further defined and introduced during the 2020 to 2024 plan period.

Actions to Address Performance

Amtrak Engineering's "Annual Operating Plan Delivery FY 2019" (AOP) sets out the action plan for addressing performance issues and achieving the strategic pillars and corporate goals and objectives outlined in Amtrak's Corporate Plan for FY19. Progress against Plan measures defined in the tables below are being used to address key performance issues. The AOP includes actions for:

- Safety
- OTP (on-time performance) and Reliability.
- Continuous Improvement towards Steady State (Capital Construction Plan).
- Execution of Engineering's Yearly Operating Plan (Department Metrics).
- Project Delivery FY19 Action Plan.

Table 3: Asset Performance Measures

Strategic Pillar	Assess by	Measure	Frequency of Reporting/Review	Customer Objectives and Measures Alignment
Excellence in Safety and Operations	By asset class	→ Inspection monthly compliance (%)	MONTHLY – Discipline coordination calls.	1. Provide safe and reliable infrastructure for train services 5. Improve network performance
Positive Customer Impact	By asset class	→ Reliability Initiatives – Progress Against Plan	DAILY – Engineering coordination calls BI-WEEKLY – Asset Reliability Meeting MONTHLY – Discipline coordination calls.	1. Provide safe and reliable infrastructure for train services 3. Manage implementation of agreements and adherence to the cost allocation policy 5. Improve network performance
Integrated Strategy	By asset class	→ Asset Data Integrity	MONTHLY – Asset Performance Review	3. Manage implementation of agreements and adherence to the cost allocation policy 4. Improve planning and project delivery
Invest in our Assets	By asset class	→ Work orders open/closed → Percent (%) of assets in a state of good repair	BI-WEEKLY – Asset Reliability Meeting ANNUAL – Infrastructure Asset Management Plan	1. Provide safe and reliable infrastructure for train services 3. Manage implementation of agreements and adherence to the cost allocation policy

Table 4: Asset Management Performance Measures

Strategic Pillar	Assess by	Measure	Frequency of Reporting/Review	Customer Objectives and Measures Alignment
Excellence in Safety and Operations	Engineering	<ul style="list-style-type: none"> → Operating rules violations → FRA reportable injury ratio 	DAILY – Engineering coordination calls BI-WEEKLY – Asset Safety Meeting	1. Provide safe and reliable infrastructure for train services
Positive Customer Impact	Engineering	<ul style="list-style-type: none"> → Acela Engineering Department's unplanned minutes of train delay 	DAILY Incident Report BI-WEEKLY – Asset Reliability Meeting WEEKLY – CEO – OTP performance call	4. Improve planning and project delivery 5. Improve network performance
Integrated Strategy	Engineering	<ul style="list-style-type: none"> → Asset management capability as measured against the am²c asset management assessment framework 	ANNUAL– Infrastructure Asset Management Plan	3. Manage implementation of agreements and adherence to the cost allocation policy 4. Improve planning and project delivery
Invest in our Assets	Engineering	<ul style="list-style-type: none"> → Top 10 infrastructure projects – project funding, planning, design and delivery milestones 	ANNUAL– Infrastructure Asset Management Plan	2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 3. Manage implementation of agreements and adherence to the cost allocation policy
	Measured for each asset class in each discipline	<ul style="list-style-type: none"> → Percent (%) of assets condition assessed this fiscal year. 	ANNUAL– Infrastructure Asset Management Plan	
		<ul style="list-style-type: none"> → Track production progress against plan 	DAILY – Engineering coordination calls WEEKLY AND MONTHLY – CEO Report	
Excellence in Financial Stewardship	Projects	<ul style="list-style-type: none"> → Core Expense (millions, core only) 	MONTHLY – PM coordination calls.	3. Manage implementation of agreements and adherence to the cost allocation policy
		<ul style="list-style-type: none"> → Core overtime ratio 	MONTHLY – PM coordination calls.	4. Improve planning and project delivery
		<ul style="list-style-type: none"> → Project Management Cost Performance Index (CPI) on select projects 	MONTHLY – PM coordination calls.	4. Improve planning and project delivery
		<ul style="list-style-type: none"> → Scope, Schedule, Budget and Resource Utilization on the FY19 Production Plan 	WEEKLY AND MONTHLY – Separate report.	

Definition of Existing Performance Measures

Excellence in Safety and Operations

Asset

- **Inspection Compliance – B&B**: The completion of inspections in accordance with FRA requirements.
- **Inspection Compliance – C&S**: The completion of inspections in accordance with FRA requirements.
- **Inspection Compliance – ET**: The completion of inspections in accordance with Amtrak requirements.
- **Inspection Compliance – TK**: The completion of inspections in accordance with FRA requirements.

Asset Management

- **FRA Reportable Injury Ratio**: The number of railroad worker on duty injuries and illnesses per 200,000 employee-hours annually (equivalent to 100 full time employees).

Positive Customer Impact

Asset

- **Reliability Initiatives – Progress Against Plan**: Measures progress against delivering the OTP and Reliability Action Improvement Plan set out in the Amtrak Engineering Annual Operating Plan Delivery FY19.

Asset Management

- **Acela Unplanned Min of Train Delay**: The total number of Acela delay minutes caused by unplanned Engineering related failures/ work, during the specified time period.

Integrated Strategy

Asset

- None currently.

Asset Management

- None currently.

Invest in Our Assets

Asset

- **Work Orders Open/Closed**: The number of active work orders, and the number of closed work orders in a period.

Asset Management

- **Track production progress against plan**: Measures progress against delivering the annual construction program, and ensures we focus attention on delivering what we have planned within the financial year.

Excellence in Financial Stewardship

Asset

- None currently.

Asset Management

- **Core Expense**: The total number of dollars spent against an operating budget, during the specified time period.
- **Core Overtime Ratio (%)**: The ratio between cost of employee overtime and regular hours during the specified time period.
- **Project Management – CPI on Selected Projects**: The percentage of the three projects selected by each of the Project Sponsors (DCEs & DEs) where the CPI values $0.90 < \text{CPI} < 1.10$.
- **Scope, Schedule, Budget and Resource Utilization**: Standard project performance measures for the FY19 Production Plan.

Definition of Proposed New Performance Measures

The following new performance measures are under consideration by the Chief Engineer for introduction during the 2020-2024 planning period.

Integrated Strategy

Asset

- **Asset Data Integrity**: Measures our accuracy and completeness of the data we hold about our assets, supporting compliance with FAST Act and PRIIA section 209 requirements.

Asset Management

- **Asset management capability**¹ – Measures our asset management capability maturity against the **am²c** asset management assessment framework. Further information is provided in the **Improvement Plan** section in Appendix A.

Invest in Our Assets

Asset

- **Percent (%) of assets in a state of good repair** – Measures our progress in reaching an infrastructure- wide SOGR.

Asset Management

- **Top 10 infrastructure projects – project funding, planning and delivery milestones**² – Measures how we are progressing priority infrastructure projects, considering funding, planning, design and delivery milestones.
- **Percent (%) of assets condition assessed within 24-month period** – Measures our progress in establishing and maintaining a condition record of our infrastructure assets against the updated asset condition assessment framework.

Asset and Asset Management Performance Review

Pursuant to 49 U.S.C § 24904(c) and 49 CFR § 625, beginning in our 2020 infrastructure asset management plan, it is intended that a one-year 'look-back' review is included with commentary on identified performance issues and proposed plans for addressing problems.

Performance Management Improvements

For 2019, Amtrak Engineering will continue to review performance metrics to focus attention on both the tactical issues that impact service delivery and the strategic issues that impact our long-term decision-making ability. There are a number of improvements that will be addressed in this planning period 2020-2024. These key improvement actions are described in the **Improvement Plan** section of Appendix A.

¹ The asset management capability assessment model (**am²c**) is an industry leading tool for assessing asset management capability across 31 quality areas and 77 subjects.

² Measures progress in meeting funding, planning, design and delivery milestones of top priority infrastructure initiatives identified in the Infrastructure Investment Priority Needs section below.

Asset Inventory

Amtrak is responsible for 2,408 track miles of track, 1,297 undergrade bridges, 1,467 track miles of electric traction, 3,294 signaling track circuits nation-wide. This includes 1,169 track miles of main-line infrastructure along the Northeast corridor – the nation’s highest speed rail line.

Overview

Amtrak owns and/or manages infrastructure nationwide with an estimated replacement value of **\$72.4 billion**. The infrastructure is largely located on the Northeast Corridor (NEC) between Washington, D.C.; Philadelphia, PA; New York, NY; and Massachusetts/Rhode Island border. Outside of the NEC, the majority is located on the Michigan line in Illinois and Michigan.

NEC Main Line

Amtrak owns and operates 1,169 track miles of main-line infrastructure on the NEC main line connecting Washington D.C.; Philadelphia, PA; New York, NY; and up to the Massachusetts/Rhode Island border (see Figure 5).

In 2018 Amtrak ceased maintenance on the 82 track miles of Massachusetts Bay Transportation Authority (MBTA) owned NEC infrastructure between Boston and the Rhode Island state line, known locally as the Attleboro Line

The corridor is largely built to operate as an FRA class 7 railroad with passenger speeds up to 125 mph. There are a limited number of track segments classified at a special ‘class 8’ status for 150 mph.

The corridor is divided into 31 Base Capital Charge (BCC) segments, each having a distinct operator.



Figure 5: NEC Main Line and Branch Lines – Accountability

Dark blue lines are owned and managed by Amtrak
Light Blue lines are managed by Amtrak and owned by others
Orange lines are owned and managed by others

NEC Branch Lines

In addition to the main-line assets described above, Amtrak also own branch lines which are considered part of the NEC in several contexts. These include:

- The 262-track miles of infrastructure up to 110mph track along the Keystone Corridor from Philadelphia, PA to Harrisburg, PA.
- The 108-track mile Springfield Line from New Haven, CT to Springfield, MA, which includes 19.5 miles of main-line track added in 2018, as part of the Springfield double-track program.
- The 19-track miles of the West Side Connection from New York Penn Station to Spuyten Duyvil, NY.
- The 12-track miles of infrastructure on the Post Road Branch from Post Road Junction to Rensselaer, NY.

The NEC branch lines are largely built to operate as an FRA class 6 railroad with passenger speeds up to 110mph.

In addition to the main-line, Amtrak maintains 66 track miles of sidings along the NEC Branch-lines.

State of New York Supported Assets

Amtrak is the responsible infrastructure manager for the long-term leased infrastructure³ on the 80.6 track miles Empire Corridor on the Hudson Line between Poughkeepsie, NY and Hoffmans (near Schenectady, NY), and owns outright two short segments of the Hudson Line in New York City and the Schenectady areas.

The State of New York contributes to the capital and operating expense of portions of this infrastructure.

National Rail Network

While 72% of the miles traveled by Amtrak trains are on tracks owned by other railroads, Amtrak is also responsible for track infrastructure assets nationwide, including:

- Owning and operating 96 track miles of up to 110 mph track from Porter, Ind. to Kalamazoo, MI., along with 17.8 track miles of sidings.
- Owning and operating 55 track miles of yard tracks and sidings in Chicago, Los Angeles, New Orleans, New York City, Oakland (Kirkham Street Yard), Orlando, Portland, Saint Paul and Seattle.
- Maintaining and operating 7 track miles of yard tracks in Hialeah, near Miami, Florida, leased from the State of Florida.

State of Michigan Supported Assets

Amtrak is responsible for maintaining and operating the 182 track miles of infrastructure from Kalamazoo, MI to Dearborn, MI owned by the state of Michigan, along with 42 track miles of sidings. The Michigan line (Chicago-Detroit Line) has been upgraded to operate as an FRA class 6 railroad with speeds up to 110 mph.



Figure 6: National Network Infrastructure - Accountabilities

Dark blue lines owned and managed by Amtrak
 Light blue line managed by Amtrak – owned by others
 Orange Line are owned and managed by others

³ Amtrak entered into a lease agreement with owners CSX in 2012.

Asset Inventory

Amtrak's Engineering Department organizes the infrastructure assets into [four asset classes](#) – Table

5 provides a summary. Further details are provided in the asset class plans in the appendices.

Table 5: Amtrak Infrastructure Assets - Summarized by Route/Ownership

Track	Bridges and Buildings	Electric Traction	Communications and Signals
NEC Main Line			
<ul style="list-style-type: none"> → 1,346 track miles of Rail main and siding → 1,883 Turnouts → 372,251 Wood ties → 2,613,568 Concrete ties 	<ul style="list-style-type: none"> → 10 Movable bridges → 451 Signal bridges → 772 Undergrade bridges → 18,187 Bridge ties → 543 Culverts → 100,476 Linear feet of tunnel 	Two systems: <ul style="list-style-type: none"> → 371 track miles 60 Hz constant tension in the north → 842 track miles 25 Hz fixed tension in the south → 23.5 track miles 60 Hz constant tension in the south 	<ul style="list-style-type: none"> → 134 Interlockings → 2,025 Switch machines → 1,217 Switch heaters → 1,973 Signals → 2,347 Track circuits → 1,323 Instrument Buildings → 1,676 miles of PTC
NEC Branch Line			
<ul style="list-style-type: none"> → 568 track miles of Rail main and siding → 551 Turnouts → 856,624 Wood ties → 329,201 Concrete ties 	<ul style="list-style-type: none"> → 1 Movable bridge → 91 Signal bridges → 336 Undergrade bridges → 8,582 Bridge ties → 383 Culverts → 2,681 Linear feet of tunnel 	<ul style="list-style-type: none"> → 254 track mile 25Hz fixed tension on the Harrisburg line 	<ul style="list-style-type: none"> → 56 Interlockings → 447 Switch machines → 193 Switch heaters → 576 Signals → 648 Track circuits → 455 Instrument Buildings → 328 miles of PTC
Infrastructure leased from CSX, Capital Funded by the State of New York and maintained and operated by Amtrak			
<ul style="list-style-type: none"> → 80 track miles of Rail main and siding → 28 Turnouts → 204,341 Wood ties → 58,896 Concrete ties 	<ul style="list-style-type: none"> → 1 Movable bridge → 9 Signal bridges → 62 Undergrade bridges → 0 Bridge ties → 0 Culverts (all culverts are owned by Amtrak) → 57 Linear feet of tunnel 	<ul style="list-style-type: none"> → There are no electric traction assets off the NEC corridor. 	<ul style="list-style-type: none"> → 4 Interlockings → 23 Switch machines → 0 Switch heaters → 89 Signals → 102 Track circuits → 38 Instrument Buildings → 0 miles of PTC
National Network			
<ul style="list-style-type: none"> → 190 track miles of rail main and siding → 556 turnouts → 399,555 wood ties → 2,112 concrete ties 	<ul style="list-style-type: none"> → 2 Movable bridge → 4 Signal bridges → 50 Undergrade bridges → 0 Bridge ties → 0 Culverts → 0 Linear feet of tunnel 	<ul style="list-style-type: none"> → There are no electric traction assets off the NEC corridor. 	<ul style="list-style-type: none"> → 27 Interlocking → 27 Switch machines → 0 Switch heaters → 142 Signals → 79 Track circuits → 59 Instrument Buildings
Infrastructure owned by the State of Michigan and maintained and operated by Amtrak			
<ul style="list-style-type: none"> → 223.9 track miles of rail main and siding → 163 turnouts → 651,517 wood ties → 2,957 concrete ties 	<ul style="list-style-type: none"> → 0 Movable bridge → 0 Signal bridges → 81 Undergrade bridges → 0 Bridge Ties → 4 Culverts → 0 Linear feet of tunnel 		<ul style="list-style-type: none"> → 18 Interlocking → 2 Switch machines → 0 Switch heaters → 198 Signals → 118 Track circuits → 2Instrument Buildings → 0 miles of PTC

Note: Tie counts do not include block ties or direct fixation

Inventory Improvement Actions

Amtrak Engineering plans to continue developing the asset inventory record. Key improvement actions are described in the [Improvement Plan section of Appendix A](#).

Asset Condition

Current Condition Monitoring (Inspection) Approaches

Amtrak currently conduct extensive condition monitoring (inspection) programs of its infrastructure assets, as further described in the [Asset Class Strategies](#) (appendices B-F). The monitoring activities—many of which are federally mandated—ensure day-to-day safe operation of the railroad. They are used to identify faults and potential faults which result in prioritized and scheduled maintenance.

Asset Condition Assessment

Except for structures (bridges and tunnels), a challenge across all asset classes is that there, historically, has been little done to assess the long-term condition of the asset. This limits the level of predictive analysis to determine future investment needs based on the state of good repair of the asset.

In 2018, Amtrak Engineering developed and introduced an asset condition assessment framework which was designed to provide an indicator of long-term trends in the state of good repair (SOGR) of the asset. The guidelines will be used to inform capital replacement decisions and investment prioritization. Pursuant to 49 U.S.C § 24904(c), this information will also be included in future versions of the asset management plan.

The asset condition assessment framework results in an assessed SOGR index for each asset. Separate condition assessment guidelines have been developed for each of the major asset classes.

Within each asset class, the ‘parent level’ to assess condition has been determined based on the intervention activity options. For each parent asset type, a condition assessment matrix has been produced that considers one or several of the following five factors:

1. [Age \(or cumulative level of use\)](#): Estimate based on the share of an asset’s useful life elapsed
2. [Visual Condition](#): Assessment based on visually identifiable signs of asset wear or deterioration
3. [Reliability](#): Assessment based on an asset’s ability to meet the required technical level of service
4. [Measured Condition](#): Assessment based on automatic, equipment-based, or manual measurement of one or more specific asset characteristics, which are indicative of the asset’s overall condition
5. [Maintenance Condition](#): Assessment based on ability to maintain condition using planned maintenance activities, and the number of outstanding maintenance activities that exist within the system requiring unplanned interventions outside of routine maintenance

For each factor, a grading system has been developed for the parent asset type that ranges from zero (asset is non-operable) through five (asset is new or nearly new). An assigned condition index has then been derived from a review of the above factors.

Asset Condition Improvement Actions

The development of asset class condition assessment guidelines was identified as an improvement action in I-AMP2017. These have largely been completed and an implementation program is progressing. The approach will be implemented through the plan period. Key improvement actions are described in the [Improvement Plan section of Appendix A](#).

Defining State of Good Repair (SOGR)

Amtrak consider an asset to be in SOGR when it satisfies the following:

- It is in a condition where it can continue to meet and perform the functional requirements for which it was designed to do
- The use of the asset in its current condition does not pose a safety risk
- The lifecycle investment needs of the asset have been met including all scheduled maintenance and where no backlog of capital needs exist

This definition is consistent with the definition laid out in U.S. 49 CFR § 625. Amtrak grade an asset in SOGR if it scores 2.5 on its updated condition assessment framework, described above.

IALP2019 – Condition Assessment Approach

In the absence of comprehensive condition assessment information, for IALP2019 Amtrak has adopted age as a proxy for asset condition in assessing SOGR. The following score ranges are provided for guidance:

- Score 5: Asset is new or nearly new; 76% to 100% of expected useful life benchmarks remaining
- Score 4: Asset is at or nearing its midlife point; 50% to 75% of expected useful life benchmarks remaining
- Score 3: Asset has passed its midlife point; 25% to 49% of expected useful life benchmarks remaining
- Score 2: Asset is nearing the end of its useful life; 0% to 24% of expected useful life benchmarks remaining
- Score 1: Asset is beyond its useful life; 0% of expected useful life benchmarks remaining
- Score 0: Asset is non-operable.

Assessed Asset Condition

Table 6 provides a summary of assessed condition by asset class, route and ownership. The replacement value of infrastructure with a condition rating below 2.5 (assessed as at or nearing the end of their useful life) is considered to be [Amtrak's SOGR backlog for infrastructure](#) and is estimated to be [\\$33.3 billion in 2018 dollars](#).

A detailed breakdown of assessed condition by asset types is presented in each asset class plan in the [Appendices B-F](#).

It should be noted that this is the estimated value of assets that are past their useful life and which need replacement. It is not the forecast project costs associated with replacing these assets. The total value of the SOGR backlog is based on unit rates proposed by Amtrak Finance and confirmed by the Deputy Chief Engineers responsible for each asset class. Many of the highest priorities for SOGR are also identified as opportunities for network performance improvement (for example infrastructure assets under the Gateway Program). The SOGR backlog figure considers the refurbishment of the existing asset only and does not consider the proposed project costs of these capital improvement programs.

Figures 7 and 8 present the backlog by line and asset class. 84% of the total backlog or \$28.3 billion is on the NEC main line and branch lines. About two thirds of the backlog is B&B, with ET and Track making up most of the remaining third. C&S accounts for a very small proportion of the overall SOGR backlog.

Table 6: Summary Assessed Condition – by asset class, route and ownership

Asset Class	NEC Main Line		NEC Branch Line		National Network	
	Average SOGR Score	% Not in SOGR	Average SOGR Score	% Not in SOGR	Average SOGR Score	% Not in SOGR
Assets Owned By Amtrak						
Track	2.84	48.2%	2.57	46.6%	2.85	45.8%
Bridges and Buildings	2.78	43.5%	2.78	37.0%	2.56	61.2%
Electric Traction	2.41	52.5%	1.17	95.2%		
Comms and Signals	2.80	25.2%	2.36	65.8%	1.40	99.9%
Assets Maintained and Operated by Amtrak – Owned by Others			Leased from CSX, Capital Funded by State of NY		Owned by State of Michigan	
Track			2.41	7.6%	2.21	67.0%
Bridges and Buildings			2.71	39.4%	2.33	74.3%
Comms and Signals			2.47	52.6%	1.37	100%

Note: Average SOGR's are weighted based on replacement value of the asset – not the proposed project value which could include additional improvements.

Figure 7: Assessed SOGR Backlog by Line - Total Value \$33.3 Billion

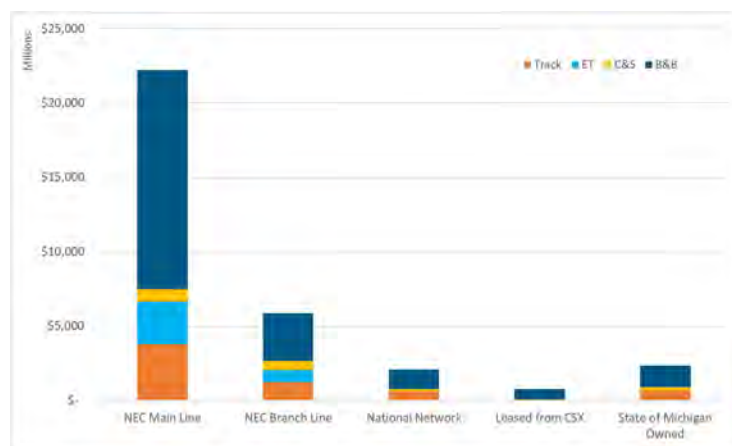


Figure 8: Assessed SOGR Backlog by Asset Class - Total Value \$33.3 Billion



Asset Strategies

Asset strategies have been updated as part of IALP2019 to capture the normalized or steady state activities necessary to achieve and maintain a SOGR, and to ensure Amtrak's infrastructure assets are functional and are able to continue to support safe, efficient and sustainable railroad operations.

Overview

Amtrak Engineering is designing a program to achieve a state of good repair (SOGR) across infrastructure assets. With the introduction of the Steady State Program in 2017 and Construction Program Procedure in 2018, there has been a renewed focus on capital maintenance. Moreover, capital improvement projects which contribute to the replacement or renewal of aging infrastructure are prioritized higher than those projects which provide little to no SOGR benefits. The Steady State Program identifies the count of units to replace annually to maintain a SOGR.

Current Asset Strategies

In I-AMP2017, Amtrak Engineering commenced a review of the asset strategies for all infrastructure assets to develop the long-term infrastructure maintenance and improvement programs to reach SOGR. These asset strategies were updated during 2018 and are included in the [appendices \(B-F\)](#).

For FY2019 on, the strategy begins to address the SOGR backlog and approach normalized or steady state levels of capital replacement to move to a sustained SOGR. It is recognized that the long-term strategy will continue to be developed – particularly

related to changes in asset configuration to improve performance and reliability. This work will therefore continue through the asset plan period (2020 to 2024).

Our current strategies can be summarized as follows:

Core Funding

- [Inspection/monitoring](#) activities to confirm the asset is able to function in its required state and provide a safe operational environment.
- [Preventive maintenance](#) activities to achieve a required level of asset performance and maintain a safe operational environment.
- [Corrective maintenance](#) activities to return the asset to its required function.

Capital Funding

- [Capital maintenance](#) to restore the asset to an operational design standard and maintain performance.
- [Capital replacement](#) to renew the asset and maintain performance.
- [Capital improvement](#) to replace the asset and improve performance or network capability.

Inspection/Monitoring Activities

Amtrak's Engineering standards set out the requirements for inspection and monitoring of assets to ensure safe infrastructure performance. With the exception of ET assets, these are aligned to FRA mandated inspections, and in some areas (including track and movable bridges for example) go beyond FRA requirements. Inspection and monitoring programs drive corrective and capital maintenance programs.

Maintenance (Preventive, Corrective and Capital) Activities

Historically, asset maintenance strategies could be summarized as run-to-fail (where fail exceeds a maintenance defined limit, and not a failed asset that is unsafe). Currently, data is being developed utilizing root cause analysis to identify high impact assets and introduce preventive maintenance replacement cycles. Corrective actions are typically assigned following an inspection. These are a mix of addressing identified faults and poor conditions which will lead to an asset failure, either through a corrective maintenance action or through a capital maintenance action.

Capital Replacement and Improvement Activities

Tools are emerging to provide a more consistent approach for planning future investment needs. The current approach relies heavily on the DCE's and Division personnel's experience and knowledge of the assets. Limited information to support long-term decisions and issues with available resources (funding, track access, equipment and labor) results in a program that is focused on replacing high-risk assets only. The capital replacement of assets is determined by engineering judgment – including conditions, safety and reliability, funding availability and track access.

In 2018, to address performance issues, Amtrak Engineering introduced reliability analysis to better inform replacement decisions. This has included identifying assets with repeat failures or assets types which may be prone to failures. The approach

has used the GIS and Geospatial Decision Support Tool identified in Appendix A.

Typically, the Track capital projects drive the overall program, with ET and C&S assets being addressed at the same time. One of the challenges with the current program approach is that external stakeholder funding (for new assets or new capabilities – for example New Jersey High Speed) dictates the priorities in the program, which can often result in needed work elsewhere not being completed because of resource constraints.

Establishing Capital Investment Priorities

FY2019 Capital Prioritization

A revised capital prioritization process was introduced in 2018 and applied to the FY2019 construction plan. Prioritization of projects was based on three factors: Safety, Customer Service, and Financial Excellence. The 0 to 5 score in each area was determined with the following criteria.

- **Customer Service** – A score of "5" would include projects which significantly improve OTP, ride quality or reliability of the asset (i.e. without this project, the asset will be taken out of service).
- **Financial Excellence** – A score of "5" would include projects that contribute to the Steady State Program and /or will result in a quantifiable return on investment.
- **Safety** – A score of "5" indicates an immediate safety concern for either our customers or employees. If there are measures that can mitigate risks to safety (i.e. reducing speeds), a "5" is not warranted.

In most cases, there should be a correlation between Customer Service and Financial Excellence.

FY2020-2024 Capital Prioritization

For the FY2020 construction plan the prioritization process has been further developed to align fully to [Amtrak's Strategic Pillars](#) to demonstrate how each project supports our corporate strategic objectives. The approach is presented in Table 7.

Table 7: FY2020 - FY2024 Infrastructure Capital Investment Prioritization Approach

Amtrak Strategy Pillar	Engineering Category and Definition	Infrastructure Capital Investment Prioritization - Rating					
		0	1	2	3	4	5
Excellence in Safety and Operations	<u>Safety</u> : Unsafe condition for employees or customers	No improvements to overall safety	Minimal improvements to overall safety	<->	Safety measures can be put in place to mitigate risk	<->	No measures can be put in place to mitigate addressed safety risk
Positive Customer Impact	<u>Customer Impact</u> : Significantly improve OTP, ride quality or reliability of the asset	No positive impact to OTP, ride quality or reliability	Minimal positive impact to OTP, ride quality or reliability	<->	Positive impact to OTP, ride quality, and/or reliability	<->	If project not completed, asset will be taken out of service with negative customer impact
Integrated Strategy	Non-Strategic Requirements Strong external requirements which may not align with Amtrak Strategic Pillars	Project aligns with an Amtrak Strategic Pillar (Already factored into priority ranking)	Project has external pressure for completion but is only in planning and/or initiation phase	<->	Project has external pressure for completion but does not have to be completed in upcoming fiscal year	<->	Project has significant external pressure for completion and must be completed in upcoming fiscal year
Invest in our Assets	Steady State Contribution Work completed will achieve steady state unit contribution	No Steady State improvements achieved	Minimal Steady State improvements achieved	<->	Steady State unit replacement contributes to annual required levels	<->	Steady State unit replacement significantly contributes to annual required levels
Excellence in Financial Stewardship	Financial Stewardship Project will have a positive return on investment	Project has no financial impact or a negative return on investment	Project has minimal financial impact or a low return on investment	<->	Projects return on investment will break even	<->	Project is funded by external resources or will result in positive return on investment

Moving Towards Normalized or Steady State Maintenance

Revised Asset Strategies

In I-AMP2017, Amtrak Engineering commenced a review of the asset strategies for all infrastructure assets to develop the long-term infrastructure maintenance and improvement programs to reach a state of good repair. These asset strategies were updated during 2018.

There are four key elements to the revised lifecycle management strategies presented in the asset plans in the appendices. These are as follows:

Achieve SOGR	The primary objective of this strategy is to bring the infrastructure assets to a state of good repair and then maintain them in a steady state to ensure sufficient capability to meet operational needs.
Prevent Insidious Decline	While Amtrak progresses towards SOGR, introduction of an enhanced assessment regime will guard against the insidious decline in the condition of any individual assets and ensure that they remain in a safe operational state.
Maintain Performance	The implementation of the steady state strategy is through a program that is prioritized to ensure that the infrastructure assets are able to function in their required state, thus minimizing performance loss due to asset faults and failures.
Support network capability improvement	The program is also designed to ensure that the infrastructure assets contribute to capability targets established through the Amtrak Service Plans, including enabling higher speed operations.

Useful Life Benchmarks

The approach taken has been to establish useful life benchmarks (ULBs) to define a program of steady state or normalized levels of capital replacement necessary to move to a sustained state of good repair. Useful life benchmarks have been established through several sources, including:

- Previous SOGR reports and studies conducted in the last five years
- Engineering review and judgement of typical asset lifecycles on Amtrak property
- Independent review by outside parties
- International benchmarking against comparable rail networks including those in the United Kingdom and Europe

Transition Strategy

The concept of a useful life benchmark supports the development of a work-bank, but it is not an asset management strategy. This is because the transition to steady state maintenance requires SOGR backlog needs to be addressed first. To address this, Engineering has identified a series of delivery strategies which must be fully implemented to effectively move to a steady state maintenance strategy. These are described in the following six sections.

Reducing Expenditure

More efficient delivery of work in the long-term reduces the funding needed and ensures that steady state maintenance is affordable. To achieve this, we need to invest in our equipment – high-output plant delivering maintenance efficiently; invest in our people – so we have qualified and experienced staff delivering the work; and invest in our asset management approaches – so we have the right information to inform our decisions, so our assets are performing to the right service levels to achieve our corporate objectives and meet the

obligations and performance targets set out in our service line plans.

Track Time Availability

Obtaining sufficient track time for maintenance work is a challenge for all railroads. The optimal solution to delivering increased steady state production while minimizing the impact on train service is to reduce track possession time in a given block. This requires more efficient production equipment, improved planning and access to resources.

Presently Engineering has four 24/7 footprints on the NEC: two Undercutters, one Track Laying Machine (TLM), and the New Jersey High Speed Rail Program.

New equipment will enable Engineering to cut its footprint in half. The new Track Laying System (TLS) will be placed on two successive three day, 12-hour shifts, with a weekly work schedule of 72 hours versus the current 40 hours. While this approach is new, we believe it has a high likelihood of success based on a two-block-possession. This will require additional freight and motive power capacity. The 80 percent increase in work time will produce a 50 percent increase in steady state units. The TLS will complete the annual steady state units in nine weeks. At the end of nine weeks the two gangs will shift to the Undercutter for 28 weeks. The second Undercutter will utilize the same 72-hour two shift scenario for the entire production season.

Further, the two-block-possession approach allows Engineering to “blitz” the infrastructure by adding electric traction, bridges and buildings, and communication and signal work to the outage thereby closing the gap between the current condition and the state-of-good repair for non-track assets.

Availability of Qualified Personnel

Historical lack of qualified personnel will be partially mitigated through a steady year-round work schedule. Presently, three 100-person gangs are employed between the TLS and two Undercutters.

While a 72-hour work week where the TLS and Undercutter work sequentially requires the addition of one 100-person gang, it eliminates the full duplication of workforce that would result from the TLS and Undercutter operating in parallel.

The production benefits of this change are outlined in Table 8. The benefits of a fixed workforce employed year-round are also significant, such as stability in key positions and the effectiveness derived from familiarity of tasks using productive, reliable equipment. Additionally, Engineering and Labor Relations are in discussions with the BMW to eliminate specific work rules that interfere with holding qualified individuals in specific jobs (operators, foreman, ET, welders, etc.). This will address the risk of “bid-out” identified in all asset classes. An additional opportunity exists for an increased rate for positions in New York City to attract and retain employees.

Table 8: Annual Production Capability for Existing and New Equipment/Gangs

Production	Existing		Proposed Strategy	
	Units	Gang	Units	Gang
TLS (Ties & Rail)	110,000 Each	1	288,000 Each	2
Undercutting	50 Trk Mls	1	100 Trk Mls	4
Surfacing	300 Trk Mls	3	500 Trk Mls	5
Wood Tie Gang	47,520 Each	2	47,520 Each	2
Switch Exchange	50 Each	2	50 Each	2

Equipment Availability

New equipment is required to address the Northeast Corridor’s concrete tie condition. The NEC has over two million concrete ties which are projected to have a 40-year life; one million Santa Fe San Vel concrete ties were installed between

1978 and 1982 and thus are on the verge of needing replacement.

Furthermore, during the 1990's, Amtrak installed 1.4 million Rocla concrete ties which began failing at an accelerated rate in 2004, requiring replacement well before the end of the projected life cycle. To date, 800,000 of these ties have been replaced while the remaining are included in the annual steady state replacement program of 73,000 ties.

The NEC and branch lines have 1.2 million wood ties, a significant portion of which were planned for conversion to concrete when the Rocla issue developed and diverted resources. This Plan presumes resuming replacing wood ties with concrete ties to provide speed increases on the NEC and branch lines as well as improved geometry, ride quality and lower maintenance costs. Neither the San Val replacement cycle, nor the Rocla replacement incorporated in the annual steady state program and the conversion of wood to concrete can be achieved with Amtrak's current equipment.

The [Equipment Asset Strategy](#) in Appendix F, sets out our proposed acquisition plan – which includes one new TLS for ties and rail replacement, two new undercutters for ballast cleaning and replacement and five new high-speed tampers for track geometry maintenance. The acquisition of these equipment assets during the plan period is critical to enabling Amtrak's strategy to achieve SOGR and transition to steady state maintenance.

Improved Construction Program

A critical factor in advancing the completion of the \$450 million program to upgrade infrastructure between Trenton and New Brunswick, New Jersey as part of the New Jersey High Speed Rail initiative has been the coordinated delivery of replacement and upgrade work across multiple asset classes. This was achieved by transferring the primary responsibility for the infrastructure to the project team in Amtrak Engineering's Capital Construction

group. This approach enabled us to better coordinate production resources to deliver the necessary work in each asset class. Lessons learned from this program are currently being implemented in our FY2019 construction program and we will continue to apply them through this plan period.

Improving our Strategies and Plans

As we move to a steady state replacement cycle, we acknowledge that the first iteration needs to be staged (prioritized) such that the ongoing work program is manageable year-over-year. The asset plans in the appendices therefore propose replacement cycles and implementation strategies. This work will be further developed, refined and implemented through the asset plan period. Our [Asset Management Improvement Plan](#) (see appendix A) provides further details on our planned improvement actions.

Addressing Funding

The backlog identified is significant (\$33.3 billion). A robust and consistent funding stream needs to be established.

An implementable shared funding strategy to address the full SOGR backlog remains a work-in-progress, with work at the NEC Commission to finalize a method for cost-sharing and mutual obligation still underway and a need for consistent, reliable Federal funding for this work not yet fulfilled.

Building Resilience in a Changing Climate

Understanding the current and future potential threats of climate change across our network is critical to the long-term stability of our business. Amtrak established a multidisciplinary Climate Change Sub-Committee in 2014 to explore these risks and respond with recommendations. Since 2015, the Subcommittee has conducted three assessments:

- **Phase I:** Reviewed and summarized existing climate change research findings and methodologies related to transportation assets and vulnerability assessments.
- **Phase II:** Detailed vulnerability assessment of Amtrak's assets along a 10-mile track segment in Wilmington, Del. Various Amtrak functions are in this area, which is susceptible to flooding.
- **Phase III:** Identified and evaluated broad adaptation measures appropriate for NEC assets within the study area.

Assessing Climate Vulnerability

Most of Amtrak's climate vulnerabilities are related to storm surges, heavy precipitation and sea level rise. To further assess these vulnerabilities, the Subcommittee developed geospatial information system maps that indicate storm surge and sea level rise in multiple scenarios along Amtrak's NEC.

The Subcommittee plans to initiate company-wide efforts including:

- **Review and adapt** engineering design standards to incorporate resiliency and long-term sustainability;
- **Identify and evaluate** adaptation measures for greater infrastructure and operational protection; and
- **Incorporate** weather-related vulnerability information into the enterprise asset management system

Risk Management of Climate Related Hazards

Amtrak's Risk Management Department engages a third-party risk modeling firm to assess the risk of damage to physical assets from catastrophes including climate related hazards. Formal catastrophe risk modeling studies are undertaken at least every three years with annual reviews conducted in association with the annual placement of insurance. Additionally, EMCS conducts a company-wide Triennial Risk Assessment (TRA). The TRA is made up of component assessments to predict expected losses for evaluated scenarios using business continuity modelling. Amtrak identifies climate change risks by leveraging the TRA data and evaluating that data against potential climate-related incidents across the system with the goal of implementing mitigation and preventive actions. Amtrak prioritizes risks along the Northeast Corridor because this is the company's largest asset. Beyond a few smaller segments of property in the mid-west, all operations outside of Washington, DC to Boston are on other railroads' property.

Risks and opportunities, including those related to climate change, environmental, sustainability, energy and other related risks are ranked and prioritized through a survey that includes stakeholders across the company within operations and support departments. Each risk and opportunity are rated according to likelihood and significance (impact), on a scale of 1 to 5; those ratings are multiplied to obtain a risk ranking. The significance rating considers potential for serious injury, financial impact, legal/regulatory impact, reputation, and ability to meet operational objectives. Each department is responsible for identifying risks and establishing specific controls to address those risks, including climate change and natural disasters. Annually, Amtrak tests effectiveness of a subset of controls in place for every department.



Ready to Build: Hudson Tunnel Project – Location Hudson River, NY-NJ

Constrained Infrastructure Capital Program

The FY2019 to FY2024 capital program (Constrained) for Amtrak Engineering totals \$6.45 billion – of which \$5.25 billion is infrastructure projects. This should be compared to an estimated annual steady state or normalized capital maintenance requirement of \$7.19 billion over the six-year period covered by this plan. In addition, we have identified a SOGR backlog of \$33.3 billion, which, along with several network performance improvement projects that are critical to addressing network capacity issues – could be started in this planning period.

Overview

Funding is critical to sustain a safe and reliable rail infrastructure. To transition to a steady state approach and to sustain SOGR, it is essential that long-term work plans can be produced within known budget parameters. Amtrak's current situation of annualized budgets and uncertain future appropriations does not lend itself to optimized whole-life-cost asset management.

Pursuant to 49 U.S.C § 24320(a)(2), the work plans presented in this section are based on funding levels authorized or otherwise available to Amtrak in a fiscal year. In the absence of an authorization or appropriation of funds, the plan is fiscally constrained based on funding available in the previous year, plus inflation.

The Infrastructure Asset Line Plan is constrained to investments Amtrak have set aside for infrastructure over the six-year period. While the year-on-year increase in infrastructure expenditure

is greater than inflation, Amtrak's overall capital expenditure is within funding levels authorized or based on funding available plus inflation. The plan therefore demonstrates Amtrak's increased allocation of funding to infrastructure projects.

In addition to the above, the asset strategies in the [appendices \(B-F\)](#) present the funding needs in excess of amounts authorized. The appendices have considered the steady state program which establishes the level of normalized renewals necessary to maintain SOGR. They also consider an SOGR program based on the assessed condition of the assets. These views are presented here for comparison.

Amtrak acknowledges that there are several gaps in the information to undertake comprehensive work plan analysis and to better forecast future expenditures. It is in our improvement plan ([appendix A](#)) to begin addressing this during this plan period.

Infrastructure Capital Investment Program (FY19 to FY24)

Our prioritized list of infrastructure capital projects for FY2019 to FY2024 is included in the [Base-year + five-year CIP in appendix H](#). A list of projects with the required attribute information including cost, benefits category and outcomes is provided.

Projects are grouped under asset class and route/ownership. Where appropriate to do so, we have also identified the geographic location of the work down to a NEC Commission Cost Allocation Policy Baseline Capital Charge segment.

The capital budget is set on an annual basis. Pursuant to 49 U.S.C. § 24320(a)(2) the plan is based on funding levels authorized or otherwise

available to Amtrak. As noted above the FY2019 to FY2024 plan includes investments Amtrak have set aside for infrastructure. It should be acknowledged that, at the time of publication, the FY2019 plan is under way.

For FY2019 to 2024 our primary focus is addressing track on the NEC (see Figure 9 for allocation of our program across asset classes and Figure 10 for allocation across routes). Table 9 provides a summary of the forecast capital plan by asset class and route. A summary of major program elements and the strategic initiatives addressed during this planning period are presented.

Figure 9: Allocation of Five Year CONSTRAINED Capital Program - FY2019 to FY2024 (Across Infrastructure Assets)

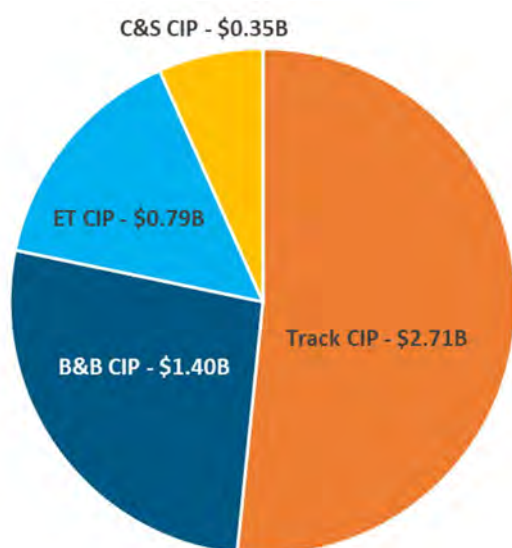


Figure 10: Allocation of Five Year CONSTRAINED Capital Program - FY2019 to FY2024 (Across Route/Ownership)

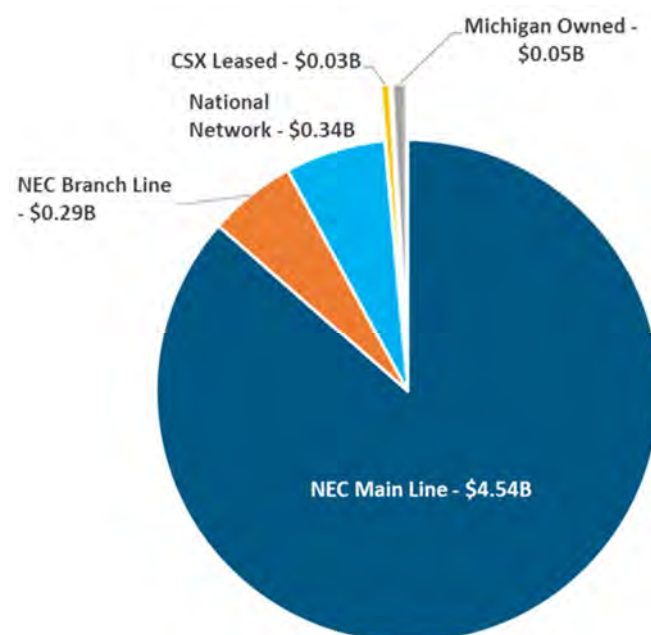


Table 9: Amtrak Infrastructure CONSTRAINED Capital Program FY2019 to FY2024 (\$)

	Route/Owner	FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	TOTAL
SUMMARY	Total - Infrastructure	743,319,429	876,914,319	865,473,599	910,209,829	931,888,457	1,345,319,931	5,673,125,564
	Total Infra SOGR	672,344,429	671,405,876	672,118,572	713,360,499	720,003,430	620,809,931	4,070,042,737
	Significant Projects	70,975,000	205,508,443	193,355,027	196,849,330	211,885,027	724,510,000	1,603,082,827
	Total - Engineering	825,723,138	923,347,003	1,070,056,117	1,157,437,432	1,062,731,456	1,408,462,227	6,447,757,373
	Total Eng. SOGR	597,024,250	601,530,160	608,625,690	650,699,220	660,426,031	559,716,715	3,678,022,066
	Significant Projects	70,975,000	178,208,443	186,525,027	196,849,330	211,885,027	724,510,000	1,568,952,827
	Equip. & Vehicles	85,985,000	91,624,750	212,405,400	177,238,882	47,170,398	48,585,512	663,009,942
	Eng. IT Projects	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	24,000,000
	Stations/ Real Estate	59,378,888	40,600,000	51,250,000	121,150,000	131,250,000	63,150,000	466,778,888
	Project Management	8,360,000	7,383,650	7,250,000	7,500,000	8,000,000	8,500,000	46,993,650
	Non-Eng. Infra. Inv.	66,960,179	89,792,066	63,072,882	55,161,279	51,577,399	52,593,216	379,157,021
	Corporate Planning	34,285,000	34,285,000	28,210,000	28,210,000	28,210,000	28,200,000	181,400,000
	Safety	25,900,000	20,150,000	19,050,000	17,600,000	12,600,000	12,700,000	108,000,000
	Operations	6,775,179	8,057,066	8,982,882	9,351,279	10,767,399	11,693,216	55,627,021
	Op. (Sign. Projects)	-	27,300,000	6,830,000	-	-	-	34,130,000
	Gateway Program	71,701,353	287,201,314	218,097,573	249,192,308	237,129,372	127,430,213	1,190,752,133
TRACK	Engineering Department Capital Program - TRACK							
	Steady State	337,564,102	320,094,450	340,843,784	415,823,475	449,889,417	395,887,256	2,260,102,484
	Major Backlog	600,000	-	-	-	-	-	600,000
	Non-re-occur. Prjts.	62,264,147	65,988,381	52,521,033	51,569,280	52,145,108	38,124,459	322,612,408
	Significant Projects	27,600,000	58,200,000	40,000,000	375,000	-	-	126,175,000
	TOTAL – SOGR	400,428,249	386,082,831	393,364,817	467,392,755	502,034,525	434,011,715	2,583,314,892
	Total – TRACK	428,028,249	444,282,831	433,364,817	467,767,755	502,034,525	434,011,715	2,709,489,892
B&B	Engineering Department Capital Program – BRIDGES AND BUILDINGS							
	Steady State	25,100,000	34,850,000	29,100,000	29,100,000	29,100,000	29,100,000	176,350,000
	Major Backlog	2,938,000	5,406,847	5,000,000	1,000,000	5,500,000	5,500,000	25,344,847
	Non-re-occur. Prjts.	23,300,000	20,300,000	8,550,000	7,750,000	7,750,000	7,750,000	75,400,000
	Significant Projects	36,300,000	48,000,000	75,000,000	130,000,000	151,000,000	680,000,000	1,120,300,000
	TOTAL – SOGR	51,338,000	60,556,847	42,650,000	37,850,000	42,350,000	42,350,000	277,094,847
	Total – B&B	87,638,000	108,556,847	117,650,000	167,850,000	193,350,000	722,350,000	1,397,394,847
ET	Engineering Department Capital Program – ELECTRIC TRACTION							
	Steady State	28,912,457	67,978,729	87,482,805	66,214,465	44,896,506	27,385,000	322,869,962
	Major Backlog	21,804,700	4,131,040	-	-	-	-	25,935,740
	Non-re-occur. Prjts.	12,100,000	16,663,829	27,246,068	31,090,000	25,340,000	5,090,000	117,529,897
	Significant Projects	7,075,000	72,008,443	71,525,027	66,474,330	60,885,027	44,510,000	322,477,827
	TOTAL – SOGR	62,817,157	88,773,598	114,728,873	97,304,465	70,236,506	32,475,000	466,335,599
	Total – ET	69,892,157	160,782,041	186,253,900	163,778,795	131,121,533	76,985,000	788,813,426
C&S	Engineering Department Capital Program – COMMUNICATIONS AND SIGNALS							
	Steady State	16,130,031	16,698,550	19,935,000	17,871,000	15,110,000	14,625,000	100,369,581
	Major Backlog	3,228,900	435,544	-	-	-	-	3,664,444
	Non-re-occur. Prjts.	63,081,913	48,982,790	37,947,000	30,281,000	30,695,000	36,255,000	247,242,703
	Significant Projects	-	-	-	-	-	-	-
	TOTAL – SOGR	82,440,844	66,116,884	57,882,000	48,152,000	45,805,000	50,880,000	351,276,728
	Total – C&S	82,440,844	66,116,884	57,882,000	48,152,000	45,805,000	50,880,000	351,276,728

Major Program Elements

Major program elements are described below. Base-year plus five-year Infrastructure Capital Investment Projects, including description, location, FAST Act categories and project benefits are provided in [appendix H](#).

Track Program

Major track capital investments include the following:

- [Track Ballast](#) –perform work to progress the ballast assets towards a state of good repair. Examples of work performed under this program are replacement through spot undercutting, removal of mud-spots, system undercutting to improve track geometry and preserve ties and rail, and shoulder cleaning where total replacements are not needed.
- [Track Drainage](#) –renew and replace track drainage assets currently not in a state of good repair. If not corrected, poor drainage will result in slow orders and higher maintenance costs associated with the accelerated degradation of track geometry. Examples of work performed under this program include the utilization of the slot-train, the Badger ditcher, and conventional earth moving equipment to re-profile existing drainage ditches and establish new ones.
- [Tie Replacement Program](#) – utilization of Track Laying System (TLS) for the complete replacement of wood tie track with concrete cross ties and replacement of concrete ties that have been found to be defective or exceeded their useful life. This replacement program will reduce maintenance costs, potential slow orders and provide for an increase in on-time performance.
- [Timber Program](#) – replace crosstie and track timber along the NEC which will reduce train delays, track geometry degradation, FRA track defects, and switch failures. Examples of work performed under this program include the installation of timber underneath turnouts in yards and block tie replacement at specific locations.
- [Track Geometry](#) – surfacing, realignment and re-profiling of track surface as required to meet FRA Track Safety standards, maintain ride quality standards and extend the life of track components.
- [Track Turnouts](#) – replacement of standard wood turnouts and associated components not currently in a state of good repair. Associated components include frogs, switch points, and wood and concrete switch timbers and other Track turnout material.
- [Track Rail Replacement](#) –replacement of rail that is currently not in a state of good repair. Amtrak replaces an average of 35 miles of rail per year. Useful service life of rail has been exceeded once horizontal or vertical wear limits, internal defect rates, or surface conditions are approaching safety limits. This program will help to reduce maintenance costs and slow orders.
- [Insulated Joint Repair](#) – repair of defective rail ends to maintain the insulated rail joints.
- [Joint Elimination Program](#) – program replacement of joint elimination to improve operational performance.
- [Interlocking Renewal](#) – total renewal of the existing track structure within interlocking limits with new advanced technology; updates include repair or replacement of turnouts, concrete switch ties, movable point frogs, and switches. These interlocking renewal projects will move the railroad towards a state of good repair by eliminating failures and reducing maintenance costs.
- [Section Improvements](#) – Section upgrade and improvement through replacement of track infrastructure to improve ride quality, increase speed and improve reliability.

Bridges and Buildings Program

Major Bridges and Buildings capital investments include the following:

- **Movable Bridges** –funding to progress Amtrak's movable bridges towards a state of good repair. Some of the bridges will be brought to a state of good repair through selective component replacement while others require complete replacement of movable structure, mechanical and electrical systems.
- **Under-Grade Bridges** –this program is to address under-grade bridges currently not in a state of good repair including conversion of open deck under-grade bridges to ballast deck for improved train performance. Some of the under-grade bridges can be brought to a state of good repair through selective component replacement and others will require complete replacement.
- **Bridge Timber Replacement** – Replacement of bridge timbers. Replacement of aging and deteriorated timbers will address SOGR needs, improve safety, efficiency and operational reliability.
- **Tunnels** –to progress tunnels towards a state of good repair. This will be accomplished primarily through component replacement or through complete replacement of the tunnel under extreme circumstances.
- **Transportation Facility upgrades** – Upgrades to Transportation Facilities – to address SOGR needs, improve safety, efficiency and security.
- **Retaining wall replacement** - Rehabilitation or replacement of retaining walls to address SOGR needs and backlog repair. Projects will improve safety and reliability.
- **Major Bridge Special Projects** – Address major bridges currently not in a state of good repair for improved train performance, eliminating slow orders that Amtrak must impose when bridge components fail and disrupt the train traffic. Continuous maintenance costs due to temporary repairs will also be avoided. While

some of the major bridges can be brought to a state of good repair through selective component replacement, most will require complete replacement such as for the Portal Bridges. Two new Portal Bridges known as Portal North and Portal South bridges will replace the obsolete 100-year old movable Portal Bridge over the Hackensack River between Kearny and Secaucus, New Jersey, expanding capacity from two to four tracks at one of the busiest points on the Northeast Corridor.

Electric Traction Program

Major Electric Traction capital investments include the following:

- **Catenary** –the replacement and renewal of catenary wire, insulators and hardware currently not in a state of good repair. Elements of this program include not only replacement of components that are beyond their useful life, but also the replacement of wire that is beyond the allowable wear percentages.
- **Catenary Pole** –many of the catenary poles are over 90 years old and are beyond their designed service life. Replacement of the poles will provide physical support to the power transmission and catenary systems.
- **Transmission** –the replacement of traction power transmission cable and associated hardware currently not in a state of good repair. Much of the existing cable has been in service for over 70 years and has far exceeded its useful life. Examples of work performed under this program include the design, purchase and installation of new solid dielectric cable, replacement of transmission lines, demolition of the existing duct bank and construction of a new duct bank, terminations, splices and testing of the new cable.
- **Substations and Frequency Converters** – improvements made to the electric traction and substations along the Northeast Corridor. Some examples of work performed under this

program are: replacement of rotary traction power frequency converters, replacement or renewal of existing power machine, and renewal of substation components such as power transformers, circuit breakers and control cables. The reliable operation of these assets is critical to on-time performance.

- **Employee Arc Flash Protection** – Assessment of the arc-flash requirements for Amtrak’s Electric Traction system and the associated substations, converter stations and signal locations to determine minimum arc flash boundaries and the required personal protective equipment when entering/performing duties at these locations.
- **Signal Power Upgrades** – Replacement and renewal of the existing rotary signal power machines that generate the 6,900 volts for the signal transmission lines. This equipment runs 24 hours a day, seven days a week, has many rotating parts and requires extensive maintenance. Another example of work provided under this program includes the upgrade of the open signal power wire to insulated cable at key locations.

Communications & Signals Capital Program

Major Electric Traction capital investments include the following:

- **ABS** – ABS component failures have been identified as a major contributor to train delay. Signal upgrades will address SOGR needs and improve railroad safety, on-time performance and reliability for all users.
- **ACSES** – ACSES is the PTC system used on the NEC. This program includes upgrades to Central Instrument House, radio transmission equipment and wayside interface units. For interoperability with freight carriers operating on the NEC, Amtrak will install I-ETMS overlay that will allow freight trains and some commuter trains to operate on the NEC without

ACSES equipment. See the Positive Train Control section of this document for additional detail. The ACSES was mandated by the FRA for high speed operation.

- **Interlocking – C&S** – this program is to address interlocking signal system components not currently in a SOGR. Upgrade signal systems at interlockings to eliminate equipment failures and reduce maintenance costs. This program involves conversion of air switch machines to electric machines, automation of manual towers and replacement of obsolete interlocking signal-system components.
- **Grade Crossings** – upgrade highway crossing detection devices for more reliable operation of warning systems and enhance grade crossing system safety while reducing maintenance costs. Examples of work included under this program include the renewal of ties, rail, and crossing material at road crossings as well as concrete tie installation at grade crossings.
- **Centralized Electrification and Traffic Control (CETC)** – replace centralized traffic control equipment in CETC locations with modern server-based systems. The existing locations do not have back-up capability. Server-based systems will allow for simplified back up in case of a disaster.
- **Radio Upgrades** – With the conversion to FCC required narrow banding, radio coverage will become an issue as signal strength is restricted by bandwidth. Engineering work (including a coverage study) and design are needed to insure adequate coverage along the right of way. As a part of maintaining adequate radio coverage C&S will needs to add additional and replace the existing analog radio voters (quality signal selector) with state of the art voters on the North East Corridor.
- **Comms Equipment Housing** – Replacement of communication equipment houses to address SOGR needs. Procure and install new equipment houses and move existing equipment and cabling into new houses.

Strategic Initiatives

While much of our infrastructure capital investment focuses on urgent SOGR backlog and normalized capital replacement, Amtrak is committed to infrastructure investments necessary to support the business in the near and long-term. The following sections provide examples of strategic initiatives and improvements which are currently being progressed during FY2019 to FY2024.

Acela 21: Next Generation High Speed Fleet Infrastructure.

This investment is necessary to run trains at maximum authorized speeds of 160 mph. Current surfacing methods are outdated and cannot be sustained on a true high-speed railroad. Amtrak plans to develop a Reference Surfacing Data Management System, undertake a baseline survey and purchase 3 sets of Surfacing Equipment. Each set will include a GPS-enabled tamper, a BMS, and a stabilizer. The expected result of this project is that maintenance practices will be reliable and repeatable. The time between tamping maintenance will increase and the wear and tear on track and vehicle components will decrease. This will result in desired track geometry and therefore higher ride quality and passenger comfort.

Delaware South Third Track

Construction of a third main track from Ragan interlocking to Brandy interlocking which will result in improved SEPTA on-time-performance and increased service frequency south of Wilmington, DE. This will also allow for increased Acela service frequency and OTP.

Yale Interlocking

Construction of a new, wired universal interlocking in Clinton, CT that would split the current 16-mile long block between Guilford and View interlockings. This would increase the flexibility of Shore Line East and Amtrak operations and enable Amtrak and SLE to expand services while reducing train conflicts and their resulting delays.

Veltri Interlocking – New England

Construction of a new interlocking that splits an 18-mile block between Groton interlocking and High Street interlocking. This will facilitate track outages to increase Engineering work efficiency and provide Engineering a location to test the new advanced technology 60 mph turnout design.

MBTA Territory of NEC

Construction of Readville to Route 128 track 3 extension to improve Amtrak and MBTA OTP as well as increasing line capacity.

Holly Interlocking to Landlith Interlocking

Renewal of Landlith interlocking and re-configure Bell and Holly interlockings, resulting in reduction of delay minutes at 22% and beneficial to Amtrak, SEPTA and DTC.

Maryland Section Reliability Improvements

Upgrade of 30 miles of existing track 1 infrastructure and associated signal system upgrades for higher speed operations. This section of the NEC operates at or near capacity today and is not able to reliably absorb increases in service without additional infrastructure improvements. This project targets reductions in congestion-related delays and provides new overtake capacity between different classes of service (high-speed, conventional, and commuter), allowing the faster, high-speed trains to pass slower trains. These improvements, along with structural and operational changes, optimize use of this infrastructure and provide the necessary capacity to meet the Service Plan requirements.

BWI Station Signals Improvement

Improvements to the signal system around BWI station to improve capacity due to the station being located on the longest signal block on the NEC.

North Penn Interlocking to Clearfield Interlocking OTP and Speed Improvements

Re-configuration of North Penn interlocking through to Clearfield interlocking to improve connections, improve ride quality, reduce maintenance costs, reduce running time and provide on-time-performance benefits to Amtrak, SEPTA, NJ Transit.

Empire Corridor South – Albany Line (With Partners NYSDOTR and MNR)

Institute a program of reference surfacing along the Albany line to improve ride quality, facilitate curve geometry improvements that could increase speeds and improve production efficiency.

In addition, construction of Poughkeepsie terminal improvements that includes high capacity signal upgrades and higher speed turnouts to improve on-time-performance for both MNR and Amtrak services.

Harrisburg Line

Institute a program of reference surfacing to improve ride quality, facilitate curve geometry improvements that could increase speeds and improve production efficiency.

In addition, undertake interlocking improvements between Philadelphia and SEPTA Frazer yard, that results in improved speed and on-time-performance of Keystone and inbound SEPTA services.

Springfield Line

Institute a program of reference surfacing to improve ride quality, facilitate curve geometry improvements that could increase speeds and improve production efficiency.

Michigan Line

Connecting sidings Kalamazoo to Niles, will result in Michigan west capacity enhancements to support improved state supported, wolverine, BlueWater and Michigan High Speed services.

Hudson Tunnel Project

Construction of a new two-track rail tunnel beneath the Hudson River and rehabilitation and modernization of the existing two-track North River Tunnel, which was inundated with corrosive salt water during Superstorm Sandy and continues to deteriorate without comprehensive rehabilitation. When complete, the project will provide increased reliability and operational flexibility for Amtrak and NJ Transit on the NEC. Additional funding is required for construction. The project has been accepted by the FTA into project development for its Capital Investment Grant program.

Hudson Yards - Phase 3

Construction of an underground concrete casing to protect the future potential right-of-way of a Hudson River rail tunnel that would connect the NEC in New Jersey to Penn Station, NY. The project extends west from 10th Avenue in Manhattan, under 11th Avenue, to its termination point at 30th Street in the vicinity of 12th Avenue. This project protects the only viable right-of-way for the future Hudson River rail tunnel that will connect the NEC in New Jersey to Penn Station, New York, which runs directly under the Hudson Yards development project, where a private developer is constructing millions of square feet of commercial and residential properties.

Portal North Bridge

Replacement of the century-old swing-span Portal Bridge over the Hackensack River with a new two-track, fixed-span bridge, allowing a modest expansion of capacity. Amtrak and NJ TRANSIT have completed final design and environmental review. The project has been accepted by the FTA into project development for its Capital Investment Grant - Core Capacity grant program but still requires funding for construction. The existing Portal Bridge is a major bottleneck and source of delay of train traffic. It has limited vertical clearance and must routinely be opened for maritime traffic. The bridge is functionally obsolete and experiences

frequent mechanical failures, resulting in a single point-of-failure on the NEC and substantial delays.

New Jersey HSR Improvement Program

With \$450 million in funding from the U.S. Department of Transportation, Amtrak is upgrading its rail infrastructure to support more frequent high-speed rail service and to improve the reliability of current service between New York and Washington. This project will upgrade electrical power, signal systems, tracks and overhead catenary wires along a 23-mile section of track between Trenton and New Brunswick, New Jersey. This will support faster, more reliable and more frequent service for all NEC users. Modern infrastructure will allow Acela services to reach 160 mph, their highest speed anywhere on the NEC.

East River Tunnel Rehabilitation

This project would rehabilitate East River Tunnel tubes 1 and 2 which connect Penn Station, NY to Queens, NY. Each tunnel is approximately 13,000 feet in length. Through this project, both tunnel tubes will be demolished down to the concrete liner and entirely rebuilt with new bench walls, communication systems, and modern electrical and signaling conduit. Rehabilitation of the track and drainage systems will require removal and replacement of track and ballast, new welded rail installations on a modern direct fixation track system, new impedance bond installations, new insulated joint installations, drainage system cleaning, and the removal and replacement of the third rail for the entire length of each tube. The tunnel renovations will also be designed to improve the safety and security (to the greatest extent practicable) in the tunnels. Some funding is available through FRA Superstorm Sandy recovery grants, but a significant funding gap remains.

Baltimore and Potomac Tunnel Replacement

This project would replace the aging B&P Tunnel (circa 1873), a key chokepoint where the right-of-way is reduced from four to two tracks and the

tunnel's tight curvature require trains to reduce speeds to 30 mph. Within the period covered by this plan the scope of works includes preliminary design and initiating construction.

Susquehanna River Bridge Replacement

In order to address SOGR and to increase capacity necessary for HSR services between Philadelphia and Washington, DC, this project would replace the existing two-track movable Susquehanna River Bridge with two modern high-level, fixed structures, each with two tracks. Within the period covered by this plan the scope of works includes completing final design and enabling projects and initiating construction.

Connecticut River Bridge Replacement.

This project would replace the Connecticut River Bridge between Old Saybrook and Old Lyme, CT that carries Amtrak and Shore Line East trains. FRA completed NEPA and issued a Finding of No Significant Impact (FONSI) for this project in January 2017. Preliminary design is underway. Within the period covered by this plan the scope of works includes completion of preliminary design and initiating construction.

Bush River Bridge Replacement

This project would replace the half-mile long Bush River Bridge connecting Edgewood and Perryman, Maryland. Within the period covered by this plan the scope of works includes completion of feasibility studies, conceptual design, preliminary engineering and NEPA work.

Gunpowder River Bridge Replacement

This project would replace the Gunpowder River Bridge, an approximately one-mile long crossing between Chase and Joppa, MD. Within the period covered by this plan the scope of works includes completion of feasibility studies, conceptual design, preliminary engineering and NEPA work.

Moving Towards Steady State and Addressing SOGR Backlog

A principal goal of IALP2019 is to begin the implementation of a transition strategy to move to normalized investment levels to maintain SOGR. To achieve this, it is necessary to address the SOGR backlog.

Steady State Capital Replacement

Maintaining a SOGR is accomplished by replacing capital components at the end of their useful life – which are defined in the asset strategies in the [asset class appendices \(B-F\)](#). For planning purposes, replacement units are calculated by taking the number of assets in the system and dividing them by their useful life. This is what we define as normalized capital replacement – or steady state.

Based on the analysis presented in the asset plans in the appendices, the steady state program– driven by the asset strategies is [estimated at \\$1.2 billion annually](#). This represents a \$0.53 billion increase over the current FY2019 authorized capital plan for infrastructure. (Amtrak received \$0.826 billion for FY19, of which \$0.668 billion is for infrastructure projects).

SOGR Backlog

The ability to maintain infrastructure assets in a reliable state, or State of Good Repair, with a steady state maintenance approach is only possible if the backlog is first addressed. To determine the SOGR backlog Amtrak has assessed the backlog of infrastructure investment, using age as a proxy for condition. Amtrak Engineering acknowledges that the physical condition of an asset and its ability to deliver safe and reliable service is determined by more than just its age. In 2019 we will be introducing a program of comprehensive asset condition assessments. The purpose of which is to improve our planning and prioritization capability, with future SOGR programs being derived on an improved understanding of asset condition and the deterioration of condition through asset operation.

Amtrak Engineering has assessed the [SOGR backlog at \\$33.3 billion](#) for infrastructure nationally. Given the advancing age of the infrastructure, historical underinvestment and the precipitous end of life facing major asset classes Amtrak Engineering have set a target of ten years to eliminate the SOGR backlog.

While achieving a 10-year schedule for all asset types would likely require more support resources (manpower, equipment and track outages) than are realistically available, Amtrak is confident that some assets such as Track, can be accomplished in this period if adequate funding is available.

Additionally, we've set this aggressive goal because the longer we delay our SOGR efforts, the greater the gap to steady state and risk to reliable service for our customers.

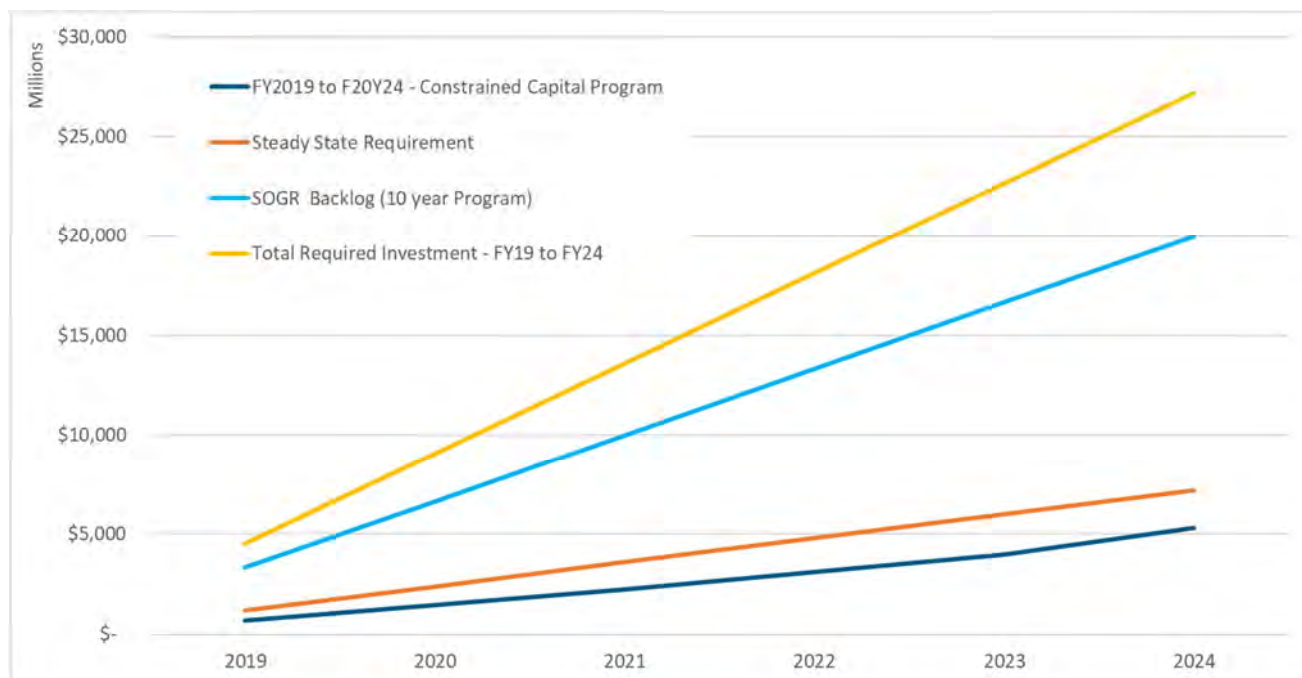
This 10-year SOGR strategy now allows us to define the funding requirements. As a result of this analysis, we have determined we will require **\$3.33 billion per year to address SOGR across all the asset categories in this 10-year window**. When assessing our forecast FY2019 to FY2024 capital funding there is a \$17.6 billion shortfall in funding to begin to address SOGR.

If full funding to achieve SOGR were available, Amtrak Engineering and Operations would be able to provide a complete analysis for the resource levels needed to deliver this work. Certain events, such as track outages, would enable construction and maintenance. But, they also would limit train operations. Operators that use Amtrak's assets (including Amtrak) would need to develop a joint work plan if we are to maintain desired service levels.

It should be acknowledged, however, that the amount to address SOGR backlog is in addition to the necessary \$1.2 billion annual steady state investment required to prevent further infrastructure deterioration. Therefore, the backlog over the 6-year planning period to transition to SOGR is **\$21.9 billion**.

Figure 11 presents a comparison of the budgeted capital program against a normalized steady state level of investment and the level of investment needed to address the SOGR backlog. We have also provided the total requirement to transition to SOGR (which includes steady state and 6 of the 10-year SOGR backlog program). It should also be noted that the 6-year forecast program includes both SOGR and **network performance improvement projects**. This analysis will be further reviewed and developed in future versions of this asset plan.

Figure 11: Comparison of Amtrak's Five-Year Forecast Capital Program FY2020-FY2024 and Estimated Steady State Program and Estimated SOGR Backlog Recovery Program (10 year)





Appendices



Appendix A: Asset Management Plan

Asset Management is now a key requirement under the FAST Act. Amtrak's Engineering Department is progressing the development of its Asset Management capabilities. This section provides a summary of the current state.

Overview

The US Government, through the FAST Act, has introduced specific requirements for Amtrak to develop an asset management system and develop and update an Asset Management Plan. These requirements and Amtrak's recognition of its current asset management maturity (see the Improvement Plan section) have resulted in a program of change projects which are in various stages of development/implementation.

Appendix A sets out Amtrak's plan for managing the infrastructure it owns and/or maintains, including its Asset Management Policy. The appendix provides a summary of the organization and its roles and responsibilities and the key business processes that guide Amtrak Engineering in delivering safe and reliable infrastructure. Amtrak's approach to risk management is described and the acknowledged gaps and proposed improvements are summarized. A roadmap is presented that demonstrates how we propose progressing our asset management maturity.

Background

In 2006, Amtrak's Engineering Department selected and implemented a work and asset management software system. The Computerized Maintenance Management System (CMMS) was initially designed to be used for timekeeping and the management of compliance with federally mandated inspections of infrastructure assets. The software application – IBM Maximo – is among the best Enterprise Asset Management applications for supporting asset intense industries with the transactional processes related to work order management, asset maintenance and asset management.

Over the last ten years, Amtrak's use of the CMMS has continued to grow. However, while data regarding inspection completion and non-conforming items are captured electronically and tracked by the maintenance organization and technical disciplines, that information is not formally integrated into existing work identification, prioritization and/or scheduling processes.

As a consequence, while Amtrak Engineering has improved oversight and control of its inspection programs, it is not currently able to use this information to proactively plan maintenance

activities or to improve the identification of preventive or predictive maintenance regimes.

Recent changes to the management structure and the introduction of FAST Act have resulted in a recognition of improvements that are necessary to

introduce a proactive management approach by which engineers make data-driven decisions – setting full life cycle strategies, establishing standards and defining the necessary investment and maintenance work.

Asset Management Policy

The Asset Management Policy defines the guiding principles by which Amtrak will manage the infrastructure it owns and maintains. The policy establishes the direction and objectives for developing asset management capability and implementing an asset management plan.

Purpose

Infrastructure asset management is the strategic and systematic practice of operating, inspecting, maintaining, rehabilitating and replacing infrastructure assets. Underpinning asset management is the strategy of preserving existing assets to extend the asset's useful life and performance. Assets will be maintained and replaced consistent with their criticality to customer service. Infrastructure asset management is a strategic approach to maximizing useful life and high service reliability while minimizing lifecycle cost in support of existing infrastructure, high speed trainsets, increased demand and profitable growth.

Principles

The Asset Management Policy applies to all infrastructure assets owned or maintained by Amtrak. It is governed by the following seven standards:

1

Asset management is undertaken within a transparent, integrated corporate-wide framework. Asset management requires the delivery by all Amtrak departments of their respective responsibilities hereunder to ensure that the goals and objectives of Amtrak's service levels are effectively and efficiently supported.

2

Ownership, control, accountability and reporting requirements for assets are established, clearly communicated and implemented. Explicitly defined roles and responsibilities are established for the management of infrastructure assets. Maintenance access is factored into train operating plans. There is a shared responsibility between Transportation and Engineering for safety, reliability and on-time performance (OTP).

3

Risk management (criticality) is used to inform the asset management decision-making process. We will continually work to better understand the characteristics of infrastructure assets through a risk management framework that will advance preventive activities to reduce risks.

4

Best in class, appropriate asset management practices are used throughout all stages of the infrastructure lifecycle. The asset management system will control activities to meet the safe, reliable, high performance expectations of our customers and stakeholders. There is one infrastructure asset management plan in place, managed by the Engineering Department.

5

Lifecycle costs are fundamental to all significant investment options and decision making.

Decisions will be data driven and consider all aspects of an asset's lifecycle. Asset management plans will exist for each asset class (Track, Electric Traction [ET], Communications and Signals [C&S], Bridges and Buildings [B&B]). These plans define the condition and performance objectives for the assets, establish the standards for accomplishment and determine the resources necessary for implementation (of the plan). The asset management plans will be fully aligned with Federal rules and regulations. Corporate policies and/or practices will be adhered to for justification and acquisition of capital approval.

6

Amtrak's enterprise technology provides information systems that support meaningful data and information for investment and management decisions.

A single system of record will be used for all asset data. Information will be transparent and accessible to those responsible for infrastructure asset management. All work will be recorded in the single system of record. There will be no work on the infrastructure without a work order.

7

Asset Management systems, processes, and practices will continually be improved.

The annual infrastructure asset management plan will include an improvement plan that will direct improvement efforts. Quality assurance will ensure that asset maintenance is conducted correctly and that asset management activities are aligned with Amtrak's vision, goals and objectives. This policy will align with corporate asset management policies as they are developed.

Responsibility

The Infrastructure Asset Management Plan will be delivered as follows:

1. **Asset Technical Owners.** Deputy Chief Engineers of Track, ET, C&S, and B&B are responsible to:
 - a. Ensure infrastructure assets achieve their economic life through asset maintenance strategy
 - b. Determine optimal point of replacement prescribed by asset renewal strategy
 - c. Prioritize asset renewal requirements to ensure cross asset investment optimization
 - d. With Transportation, establish asset criticality through identification of infrastructure pinch points
2. **Engineering Planning.**
 - a. Establish infrastructure maintenance and renewal strategies with Asset Technical Owners
 - b. Build and deliver the infrastructure asset management plan – which includes the five year capital program based on well-understood prioritization criteria. The infrastructure asset management plan is to be compliant with FAST Act and Amtrak NEC FY17 Grant Agreement requirements
 - c. Integrate State requirements with asset investment strategy
3. **Asset Plan Delivery.** Assistant Vice President (AVP) of Maintenance is responsible to:
 - a. Implement the maintenance strategy developed by the Asset Technical Owners
 - b. Provide asset condition and risk assessment information to Asset Technical Owners
 - c. Document all infrastructure work through work orders
 - d. Share reliability and OTP goals with Vice President (VP) of Transportation
 - e. Jointly own track access plans with VP Transportation

4. **Capital Project Delivery.** Assistant Vice President (AVP) Project Delivery is responsible to:
 - a. Manage delivery of capital projects within scope, schedule, and budget
 - b. Ensure opportunities for piggybacking maintenance on capital projects track access are explored
 - c. Manage the transition of new and rehabilitated assets to operations and maintenance
5. **Asset Management Essential Support.** Asset Management is undertaken within a transparent, integrated, corporate-wide framework.
 - a. EVP Chief Financial Officer: Deliver a reliable funding stream that aligns with the Infrastructure Asset Management Plan. Provide current, reliable and easy-to-access financial information to permit analysis of asset useful life and replacement costs.
 - b. EVP Chief Commercial Officer: Deliver a long-term business plan for the Northeast Corridor consistent with established asset criticality and the one infrastructure asset management plan.
 - c. VP Transportation: Jointly with AVP of Maintenance, own track access plans having shared reliability and OTP goals.
 - d. VP Chief Procurement Officer: Maintain inventory investment to support asset maintenance plans; deliver a staff of professional buyers who understand infrastructure commodities, services, and equipment for timely purchase; lead strategic acquisitions of equipment to support asset renewal strategy. Establish and publish standard purchase action lead times by level of complexity and cost. Provide reliable purchase delivery status to ensure materials, equipment, and services are smoothly integrated into work plans.
 - e. VP Human Resources: Deliver a trained and fully-staffed Engineering workforce that aligns with the 1-5 year asset renewal plan.
 - f. VP Chief Information Officer: Deliver a best in class computerized maintenance management system (CMMS); highly skilled developers and support staff who understand out of the box CMMS functionality; a mobility solution for work and asset management to Engineering front line personnel; develop and deliver service level agreements to ensure the efficiency and effectiveness of user support.

Leadership Commitment



Infrastructure Asset Management Policy

Leadership Commitment:

President and CEO

A handwritten signature in blue ink that reads "R. Anderson".

Richard H. Anderson

EVP Chief Operating Officer

A handwritten signature in black ink that reads "Scot L. Nagarstek".

Scot L. Nagarstek

VP Chief Engineer

A handwritten signature in black ink that reads "Gerhard Williams".

Gerhard Williams

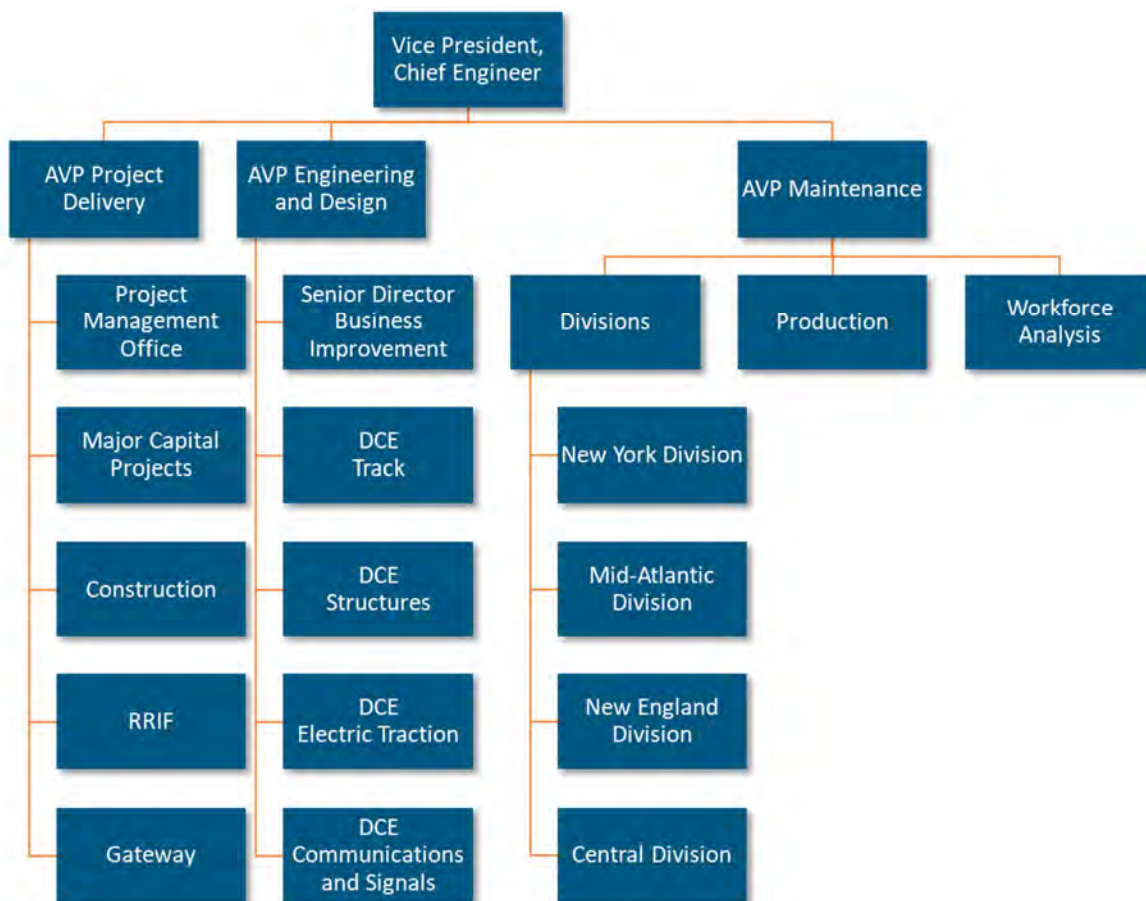
Asset Management Practices

Infrastructure Asset Management at Amtrak is enabled through an organization, with asset and asset management decisions informed by asset knowledge and information, supported by technology and implemented through business processes that ensure we have consistent practices.

Engineering Organization

Amtrak manages its infrastructure through the following organization (see Figure 12).

Figure 12: Amtrak Engineering Department – Organization



Summary Roles and Responsibilities

Our business practices and key roles and responsibilities are summarized around the eight pathways⁴ for asset management:

- **Alignment to organizational goals** – Performance targets are derived from business planning goals and objectives and are monitored by the Chief Engineer and his direct reports.
- **Control of assets** – Amtrak Engineering Deputy Chief Engineers (DCEs) set standards for compliance that are then implemented by the Assistant Vice President (AVP) Maintenance. The DCE's are also responsible for monitoring asset related risks.
- **Asset management decision-making** – Both Amtrak Engineering DCEs and Corporate Planning identify capital needs. Preventive maintenance requirements, standards and scope are determined by the DCEs for the asset classes. Maintenance delivery decisions are made by the AVP Maintenance's divisions.
- **Capital planning and delivery** – Corporate Planning forecasts service demand and develops the service plan and growth capital projects. The capital requirements for asset renewals are developed by Amtrak Engineering DCE's for each asset class. Corporate Planning acquires funding for the NEC One Year Implementation Plan, which is delivered through a mix of Amtrak Engineering, Capital Construction and outside contractors.
- **Maintenance planning and delivery** – AVP Maintenance engineers oversee all maintenance scheduling and delivery across all infrastructure assets. They work to standards defined by the technical disciplines. Maintenance typically consists of inspections and corrective actions. Maintenance scheduling

also interfaces with capital activities due to the common resource pool.

- **Operations and incident management** – AVP Maintenance oversees immediate responses to incidents, while the DCEs for the asset classes are involved in investigation and review. (Note: there are separate processes for major incident and event management which are managed by Transportation and others depending on the severity and type of event/incident, and are not discussed here).
- **Informed decisions** – Asset data resides in CMMS and many legacy systems/spreadsheets that are used to capture inspection completion and non-conforming items. The Senior Director Business Improvement is responsible for developing the capabilities to ensure decision makers have access to information.
- **Resource capabilities** – At the asset class level, resources are shared across capital projects and maintenance. The AVP Maintenance is accountable for Workforce Management and Labor Clearance, Agreements and Discipline.

Engineering Asset Management Team

To coordinate and bring various asset management activities together across Engineering, Amtrak has established an Asset Management Team under the direction of the Senior Director Business Improvement. Supporting this team, Amtrak has established an Asset Management Steering Group, with representatives from each of the infrastructure asset classes. The purpose of this group is to:

- Support the delivery of the improvement activities in the Engineering Asset Management Improvement Program through participation, support, guidance and direction.

⁴ The WSP am²c assessment model, which Amtrak used to assess asset management maturity, considers eight pathways necessary for asset

management success. Each pathway representing a group of operational processes that achieve a common purpose.

- Ensure resources are made available to enable successful task development, implementation and integration with current practices.
- Act as champions for asset management within the business and support the development of engagement and culture change required for project success.
- Guide the identification of improvement opportunities and direct the actions to improve future planning performance.
- Support the communication and circulation of information about EAM and the Asset Management Plan.
- Solicit input about the Infrastructure Asset Management Plan and the EAM planning process to support future improvements.

Core Business Processes

Table 10 provides a summary of Amtrak's core business processes and planned improvements. Amtrak Engineering is working to develop an overall asset management framework (management system), consistent with the requirements set out in the FAST Act and aligned to industry best practice – including ISO-55001:2014.

To demonstrate the interactions between core business processes to achieve our performance objectives we have developed the following series of five core process workflow diagrams (see Figures 13 to 17).

Figure 13: Providing safe and reliable infrastructure for train services – through a day to day focus on asset performance

The workflow demonstrates how Amtrak currently manages the infrastructure on a day-to-day basis with a focus on safety and reliability, addressing issues as they arise and identifying opportunities for improvement.

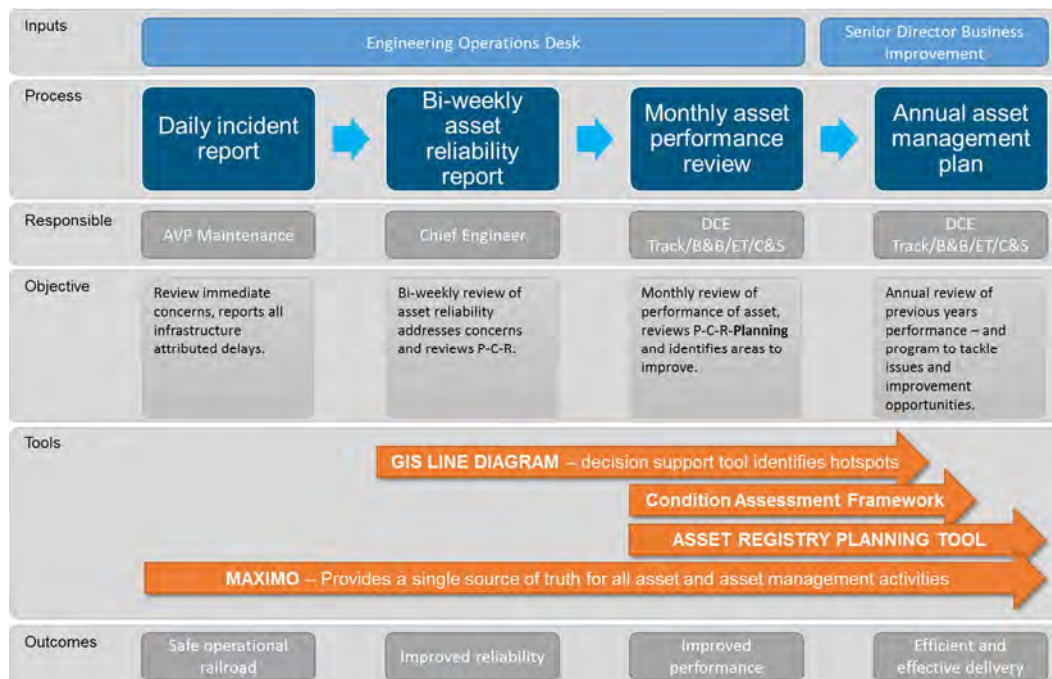


Figure 14: Obtaining funding and financing for infrastructure investment and improving network performance – through a more comprehensive asset management planning approach
The workflow demonstrates how Amtrak plans to develop asset plans to achieve the required infrastructure performance – including where necessary future network performance.

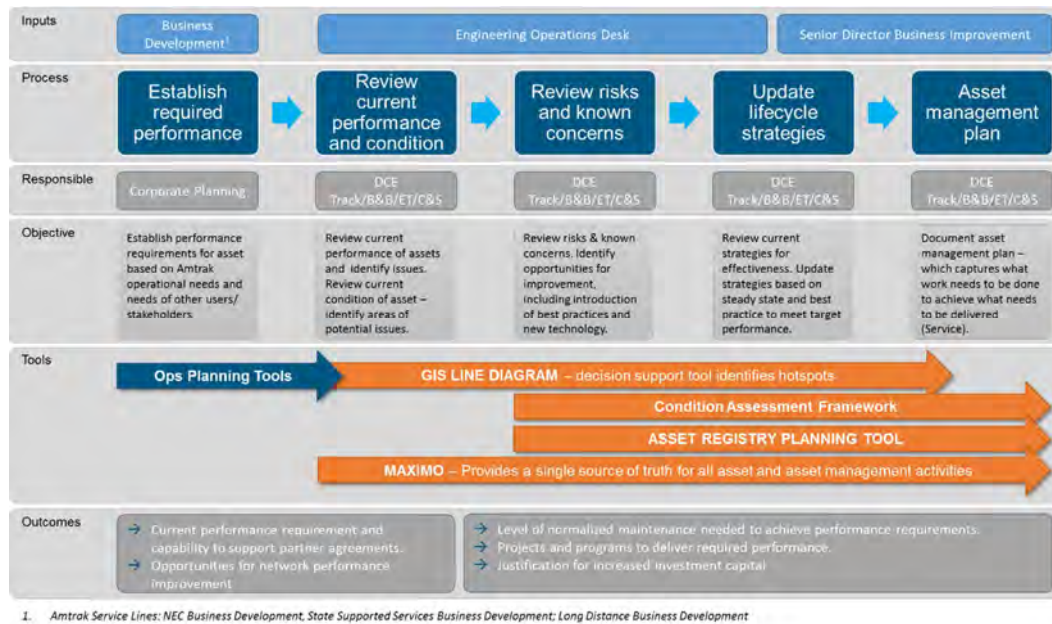


Figure 15: Supporting adherence to the cost allocation policy - through better maintenance planning and cost capture
The workflow demonstrates how Amtrak plans to deliver maintenance to provide cost transparency and support adherence to the cost allocation policy.

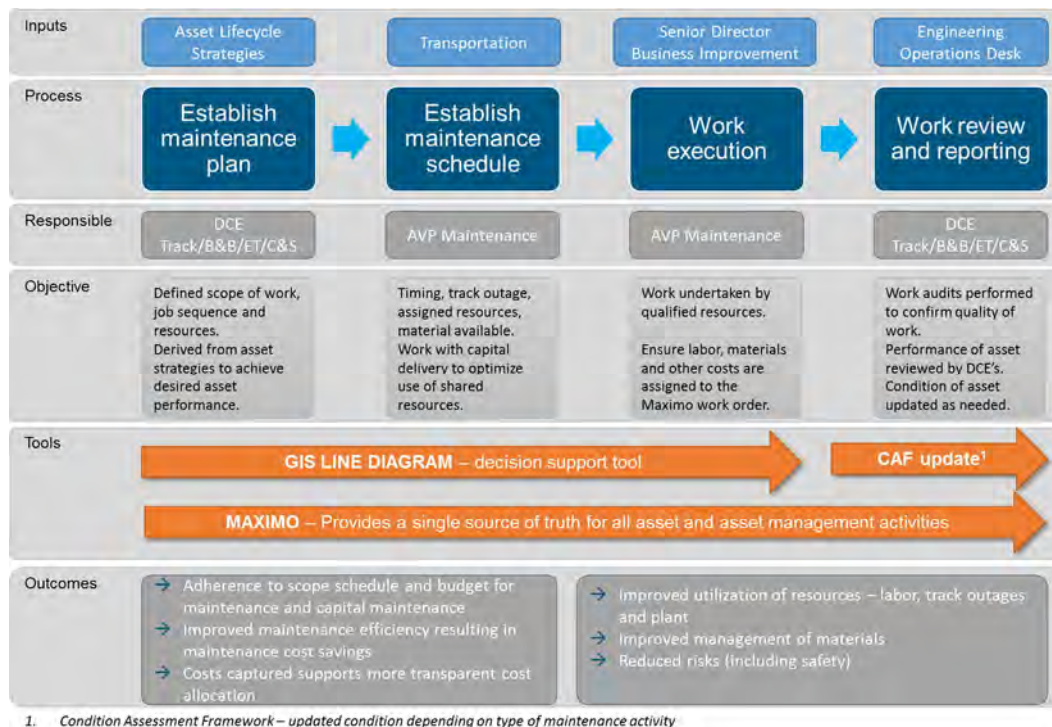


Figure 16: Improving capital planning - through prioritized plans that are linked to performance requirements
The workflow demonstrates how Amtrak plans to improve capital planning to ensure goal driven projects and programs are established to deliver required performance, and support justification for increased capital investment.

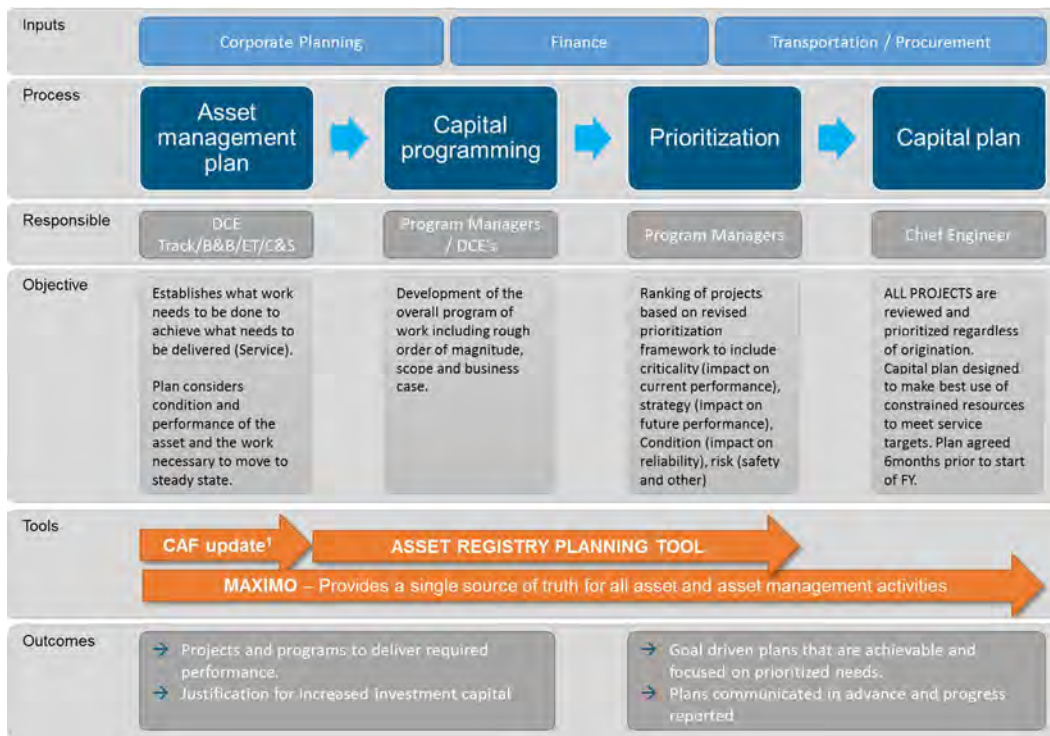


Figure 17: Improving project delivery - through better capital project management and close out
The workflow demonstrates how Amtrak currently delivers capital projects

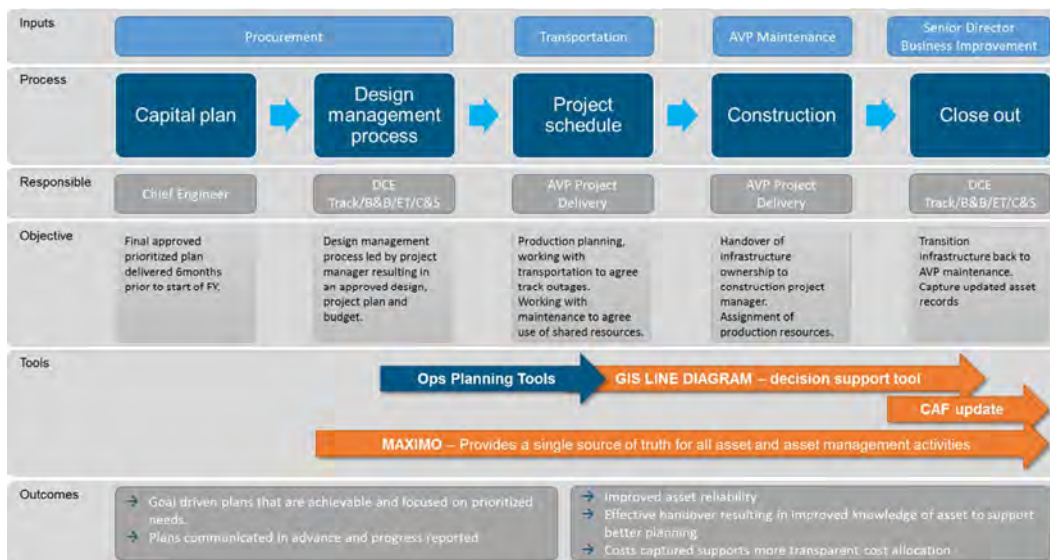


Table 10: Amtrak Engineering - Core Business Processes - Status and Improvement Initiatives

Core Process	Status	Improvement Initiative
Alignment to organizational goals		
Long-term strategic planning	Organization strategic planning is not at sufficient granularity, to translate into asset or asset management objectives.	Align Amtrak's five-year corporate strategy, Five-Year Service Line Plans and the asset plans, to establish a clear, common purpose. (Key Improvement Action 002)
Service planning	Current service plans do not provide the level of specificity needed to develop technical levels of service (performance targets) for each asset class.	Further develop Amtrak's Five-Year Service Line Plans, capturing customer level-of-service targets for infrastructure performance, and align with service agreements with Amtrak Transportation and other users of (commuter and freight) Amtrak's infrastructure. (Key Improvement Action 001)
Control of assets		
Daily incident reporting	Daily incident reporting and reviews are conducted by Engineering management each morning. The review considers all faults or failures resulting in train delays. Immediate concerns are identified, and plans put in place to address. New report format – delivered by the Engineering Operations Desk – sets out what happened, the cause and how it was resolved (referred to as problem-cause-remedy). Further analysis is conducted on repeat failures within a 90 day period.	Continue to develop and roll-out reporting in line with further development of asset and asset management performance measures. (linked to: Key Improvement Action 004)
Bi-weekly reliability meeting	Bi-weekly reliability meetings are conducted by Engineering management.	Continue to develop and roll-out reporting in line with the further development of problem-cause-remedy reporting to introduce planning and identifying preventive measures. (linked to: Key Improvement Action 023)
Monthly asset performance review meeting	Monthly reviews of the asset performance, projects and initiatives are conducted by the DCE's for track, ET and C&S. Action on systemic and repetitive failures are taken.	Further develop monthly asset performance review meetings to include monitoring and review of asset management planning and risk management outputs. (linked to: Key Improvement Action 024)
Management system	Asset standards, procedures, and specifications are documented, but in some areas require updating. Asset management practices are being developed – including reliability monitoring, condition assessment, lifecycle strategies, asset management plan development and review and capital prioritization.	An overall asset management framework will be developed through 2019 and a plan established to continue to document standardized asset and asset management practices during the planning period 2020 to 2024. (Key Improvement Action 006)
Asset management improvement	Amtrak Engineering undertook a capability assessment in 2016 and again in 2018. We propose continuing to review and improve asset management capability through the asset plan period.	We intend to continue to review our capability every two years.

Asset risk management	<p>Risk management occurs across the Engineering Department and is highly focused on maintaining a safe and reliable infrastructure.</p> <p>As part of I-AMP2017 Amtrak introduced processes for risk identification and treatment. This was further updated during 2018 and will continue to be developed during the asset plan period.</p>	<p>Continue to progress the development of risk management processes as outlined in the Risk Management section.</p> <p>(Key Improvement Actions 024, 027, 028)</p>
Key performance measures	<p>Key Performance Indicators are primarily associated with on-time performance of trains, with the greatest performance benefits associated specifically with Acela trains.</p> <p>Performance measures related to infrastructure performance have been introduced as part of the Annual Operating Plan Delivery FY19. Measures focus on OTP and reliability action improvements. Targets are set quarterly and focused on addressing asset issues.</p>	<p>Continue to progress the development of asset and asset management performance measures as outlined in the Asset and Asset Management Performance section.</p> <p>(Key Improvement Actions 002, 004, 005)</p>
Work activity assurance and review	<p>For FRA mandated inspections: An audit process is in place to ensure that inspections required by FRA and Amtrak standards are undertaken and appropriately recorded.</p> <p>For maintenance and construction activities: There is currently no audit program to ensure maintenance was conducted efficiently or completely.</p>	<p>Introduction of a quality assurance process to ensure that processes and procedures are followed and provide confidence that “we do what we say we do”. Alignment of inspections with asset information needs.</p> <p>(Key Improvement Action 007)</p>

Asset management decision making

Asset strategies	<p>Current maintenance limits and requirements for inspections are captured in each asset class’ standards.</p> <p>Lifecycle strategies for capital maintenance, replacement and improvement were developed for I-AMP2017 and have been updated as part of IALP2019. The strategies begin to define the steady state or normalized maintenance necessary to sustain each asset class and estimate the state of good repair backlog necessary to transition to steady state.</p>	<p>Continue developing the asset lifecycle strategies through the plan period. This will include further analysis of the strategy based on updated asset information and further analysis of the implementation of the strategies based on funding levels and addressing other issues (track access, resourcing etc.).</p> <p>(Key Improvement Action 031)</p>
Prioritization processes	<p>Prioritization of asset investments was introduced during 2018 for the development of the 2019 construction program. The approach scored each project against three key pillars – safety, customer service and financial excellence.</p> <p>This process continues to be developed during 2018 and 2019.</p>	<p>Introduction of a criticality framework to determine the service impact of individual sections of the Amtrak system.</p> <p>(Key Improvement Action 027)</p> <p>Introduction of a capital evaluation and prioritization processes and procedures that require lifecycle cost analysis, consider full benefit/ costs and include risk and criticality assessment. The process will be applied to all projects regardless of origination. This will ensure constrained resources are utilized to address the needs of the infrastructure that have the greatest impact on performance overall.</p> <p>(Key Improvement Action 030)</p>

Asset management planning processes	<p>I-AMP2017 established a baseline from which Amtrak Engineering will continue to develop its practices.</p> <p>Processes related to update, further development, monitoring and review will be launched in 2019.</p>	<p>The processes for managing asset management planning and ensuring it is integrated into other business planning processes, including maintenance and capital budgeting, have been developed through the course of IALP2019 and will be launched in 2019. (Key Improvement Action 008)</p>
Condition assessment	<p>Amtrak Engineering undertake a range of condition assessment processes as further described in the appendices. These assessments focus on ensuring the assets current condition meets safe operational standards.</p> <p>Pursuant to 49 U.S.C § 24904(c) Amtrak has developed an asset condition assessment framework and a series of guides for each asset class. The framework assesses the long-term condition of the asset and is used to support capital planning and prioritization decisions.</p>	<p>Amtrak Engineering is currently in the process of implementing an asset condition assessment framework and a series of guides for each asset class. (Key Improvement Actions 017, 018, 019)</p>

Capital planning and delivery

Capital program development	<p>The capital program consists of capital maintenance, capital replacement and capital improvement projects. Capital maintenance and replacement projects are requested through an established Engineering business process. Capital Improvement projects are identified by Corporate Planning. To be included in the capital program, a project must have a full WBS breakdown for the development/ implementation process. Value engineering must be performed for projects whose construction costs exceed \$10 M.</p>	<p>Improve as part of the documentation of standardized asset management practices. (Key Improvement Action 006)</p>
Capital program management	<p>While Amtrak creates a Five-Year Capital Investment Plan, it is only able to commit resources to the first year of the plan. This introduces challenges related to efficient delivery of the capital program management.</p>	<p>This is captured as a risk in our risk register. (Risk – Eng009).</p>
Capital project delivery management	<p>Amtrak has processes in place to ensure that construction standards and quality control are achieved. The procurement process for contracted work are also well-defined.</p>	<p>No action required.</p>
Asset commissioning and handover	<p>Current processes for commissioning and handover of assets are not well documented. The transitioning task is left to the project manager resulting in inconsistencies and gaps.</p>	<p>Improved as part of the documentation of standardized asset management practices. (Key Improvement Action 006)</p>

Maintenance Planning and delivery

Mandated asset inspections/ condition monitoring	<p>Amtrak Engineering currently conducts extensive condition monitoring (inspection) programs of all its infrastructure assets, as further described in the appendices.</p>	<p>No action required.</p>
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Maintenance definition/ planning	Current maintenance limits are captured in each asset class' standards. Preventive maintenance is generally not undertaken. Maintenance planning is inhibited by the high volume of reactive/corrective work necessary.	Plan and implement a maintenance strategy review of all asset classes to determine the most appropriate strategy is in place. (Key Improvement Action 031)
Inventory management	SAP is used to manage the materials inventory. Processes are in place for aligning material availability to recurring inspections and maintenance. However, inventory is not always available to meet emerging needs. Material usage reports support efforts to optimize inventory levels and determine which materials should be considered for obsolescence.	Asset management plan will provide a forward view of necessary work. Procurement to review purchase action lead times and develop procurement plan aligned to asset management plan. (Key Improvement Action 015)
Operations and incident management		
Operations management/ access planning	Track access remains a challenge for Amtrak. Processes are in place for scheduling major track outages, but as much of the maintenance intervention is reactive, attaining planned outages is challenging.	Review and further development of the track outage process – including review of opportunities to re-engineer the current process to provide improved planning to enable better use of track access time. This will include developing processes to deliver better 'piggybacking' of track access. (Key Improvement Action 009)
Engineering operations desk processes	The Engineering Operations Desk is responsible for documenting asset failure information in the CMMS and analyzing and reporting that information to management. The information is received from front-line support desks such as the C&S Trouble Desk and ET Power Directors, or directly from the Transportation department when those processes do not exist. Work orders are created and routed to field personnel to complete the feedback loop for the resolution of failures with completed Problem, Cause and Remedy.	No action required.
Fault management	Asset in-service faults are called into the appropriate trouble desk. Faults are recorded as an open work order in CMMS with no resources assigned. Fault management is reviewed by the Chief Engineer weekly using the Work Order open/closed indicator.	No action required.
Incident management	The Emergency Management Department handles any significant incident, and the Transportation Department is responsible for communication. In the event of an incident, evidence is gathered as necessary and a work order is set up to capture the costs associated with the incident.	No action required.
Business continuity planning	Reviews of the infrastructure for life safety and survival during catastrophic events are undertaken, and capital programs are established to address needed improvements.	No action required.

Informed decisions

Asset cost capture	A general cost code is used to capture costs related to maintenance and renewals work. This limits Amtrak's ability to optimize asset replacement based on whole-life-cost. Amtrak recognizes that PRIIA requires additional segregation of cost reporting, which necessitates a new approach to maintenance cost capture.	Establish a cost capture model for all maintenance and renewal activities at the asset level – which includes review and development of a revised G/L structure. (Key Improvement Action 010)
Asset information standards	Asset hierarchy structures have recently been reviewed and aligned with Amtrak's reporting needs. Amtrak Engineering lacks an information standard that provides a management framework for the collection, maintenance, and update of asset information.	As part of Amtrak's upgrade of CMMS – asset hierarchies have been developed and an information standard is in the process of being finalized. (Key Improvement Action 011)
Asset Registry	The asset registry is currently maintained in the Engineering Management Database. There are gaps in the attributes held against assets (for example age or type data is missing).	Improvements to the asset registry information in line with the improvement actions identified in the appendices. (Key Improvement Action 006)
Asset inventory/ registry management	The Engineering Infrastructure Management Database (EIMD) serves as a central repository for asset inventory data; additional data is held in the CMMS system. These tools are being further developed as outlined below.	See below.

Resource capabilities

Workforce strategy	Amtrak is currently undertaking a review of workforce needs.	No further action identified.
Competence and training	Roles are well-defined, and Amtrak ensures that employees receive the necessary training and certifications required to perform each role. This is supported by an internal system that tracks individual employee licenses, certifications and qualifications.	No action required.
Workforce succession planning	Amtrak is aware of its high attrition rate resulting from a generation of retirements. The agency has taken initial steps towards succession planning by forecasting the attrition and by identifying the skills and knowledge gaps associated with the attrition. Additional succession planning is constrained by an HR policy that limits on-the-job training that new employees could potentially acquire from retiring employees, who have the institutional knowledge. Succession planning is challenging for the unionized workforce due to union rules that facilitate employees moving between roles.	No action required.
Supplier management	Processes for managing contractors during capital projects are not well-established.	Improved as part of the documentation of standardized asset management practices. (Key Improvement Action 006)

Asset Management Core Supporting Technology

To support the execution of the business processes identified above – Amtrak has a number of supporting technologies to enable access to information to inform decisions, to control the execution of processes and to demonstrate compliance that activities have been completed. Table 11 provides a summary of Amtrak's core asset

management technologies and planned improvements.

This table has been recently updated to include Amtrak's development of GeoDrive – an Enterprise solution designed to support improved track safety and asset management.

Table 11: Amtrak Engineering - Core Support Technology for Asset Management

Core Technology	Status	Improvement Initiative
CMMS	CMMS was implemented in 2006 to help monitor and execute work against the asset – primarily focused on demonstrating FRA inspection compliance. Not all functions within CMMS are utilized and the current version has been highly customized to include FRA inspection compliance functionality and a condition logic matrix. This has introduced challenges in further utilizing CMMS to support asset management decisions. This includes poor transparency between work completed and the asset on which it was performed (the linkage is there, but improvements could be made).	<p>Amtrak plan to migrate from Maximo version 7.5 to version 7.6. To do so, will require a full re-implementation due to the previous highly customized configuration.</p> <p>The reimplementation rescheduled for 2020/21 will utilize more of Maximo's standard functionality for transportation users. The previously developed condition logic matrix and FRA compliance functionality will be carried over.</p> <p>The new install will ensure CMMS provides the single source of truth of our infrastructure assets – and will do away with the EMD as a separate application.</p> <p>Several initiatives are already underway to prepare for a future upgrade including the introduction of full linear model capability, updated asset hierarchies and location referencing for all assets along the right-of-way. Work-order capability has also been improved with asset relationships rebuilt and renamed to improve search capabilities.</p> <p>(Key Improvement Action 031)</p>
Engineering Information Master Database	EIMD is the master record of all asset data. It is a SQL server database from which CMMS and GIS tools extract information.	The need for EIMD will be removed following the upgrade of CMMS.
Mobile Maximo	Amtrak currently use Informer as a mobile product for providing data to technical staff in the field. The application is currently deployed with some success. Importantly, it has provided Amtrak with a further understanding of the functionality it wishes to introduce in the future.	<p>Following the lessons learned on the need of mobile functionality and the requirements for updating data between Maximo and the mobile device, Amtrak is migrating to IBM Maximo Anywhere as its mobile platform of choice. This will be completed by 2019. Maximo Anywhere provides increased functionality that is more easily deployable due to its integration with Maximo.</p> <p>(Key Improvement Action 032)</p>

GIS and Geospatial Decision Support Tool	Amtrak implemented Optram to support the analysis of track geometry data and demonstrate asset conditions at specific locations. The application is not well supported and requires significant effort to migrate data from CMMS for visual analysis. Amtrak is currently piloting both geospatial and geo-schematic visualization tools which are fully integrated into CMMS. This solution enables full analysis of a right-of-way section and allows Amtrak to visualize all assets, outstanding work items and other data to determine an optimal construction program – including integrating across multiple asset classes. (See Figure 18)	Continued roll-out of the piloted geospatial and geoschematic visualization tools. Full integration of these tools with CMMS will be completed as part of the upgrade to Maximo version 7.6.
Asset Registry Planning Tool	Introduced as part of I-AMP2017, the asset registry planning tool is an Excel tool that provides a snapshot in time of the asset data in CMMS and supports the DCE's in asset management and capital planning, by identifying steady state maintenance needs, and assets with poor condition assessments. The tool includes a dashboard at the asset class level to show what the current SOGR measures are, the current forecast (budgeted) work plan and how that compares against steady state and SOGR estimates. (See Figure 19)	The Asset Registry Planning Tool will continue to be developed in 2019, with additional functionality added for planning purposes. (Key Improvement Action 033)
GeoDrive	Introduced in 2018 and released to all 20,000 employees as an App, GeoDrive is an enterprise solution that supports safer working practices. The first App is CurveBook which identifies safety clearance issues and supports improved surfacing construction programming. In addition, we have released a beta version of Rainplots Geometry Data which supports trending analysis and exception reporting. Over the next five years the Track Analytics group will continue to develop capabilities and further support asset management decision making. (See Figure 20).	Future applications will use Discover analytics – to determine the optimal use of track outages, and predictive analytics to analyze multiple data sets to support the identification of preventive maintenance measures.

Figure 18: Screenshot of Amtrak GIS and Geo-schematic Decision Support Tool

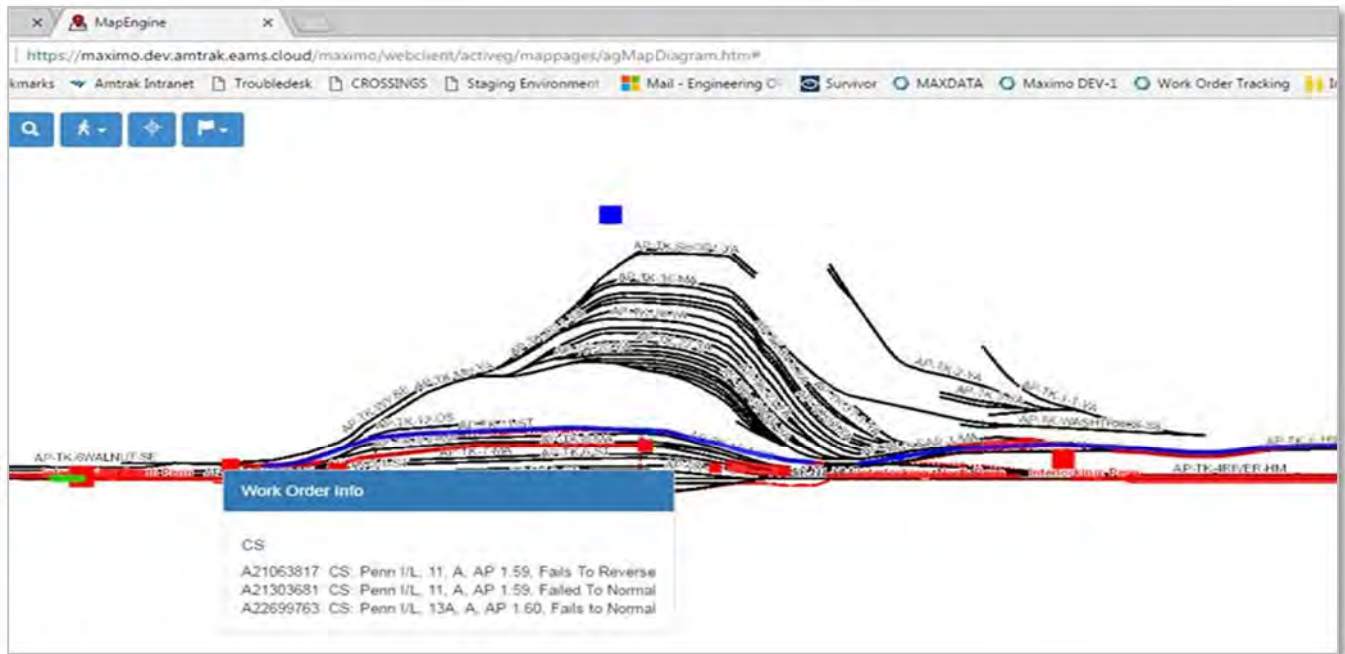


Figure 19: Screenshots of Asset Registry Planning Tool (under development and included in Asset Plans in appendices).

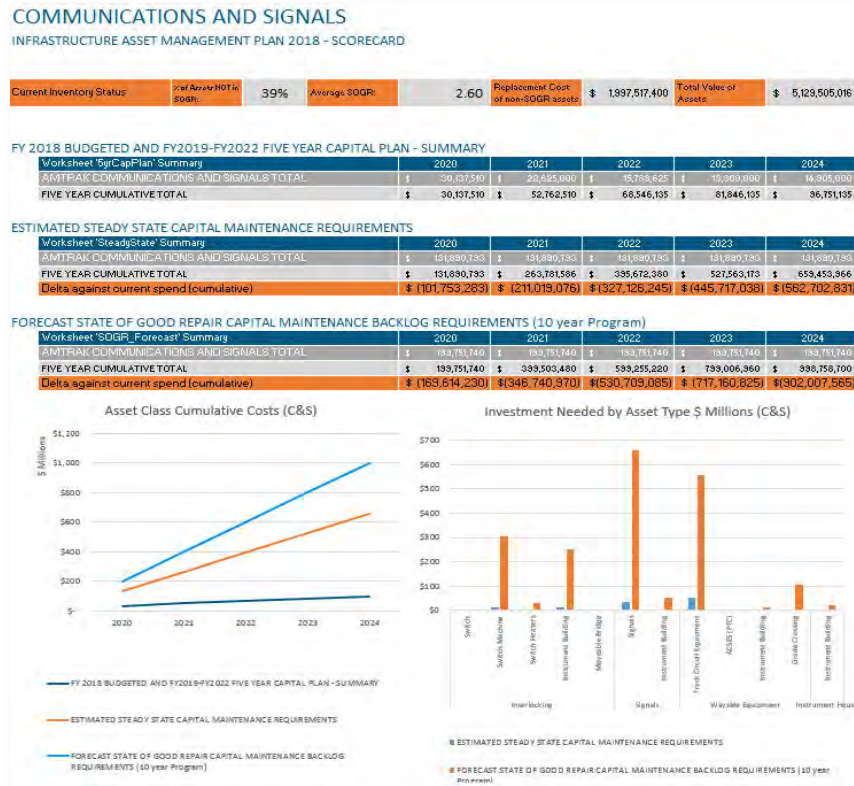
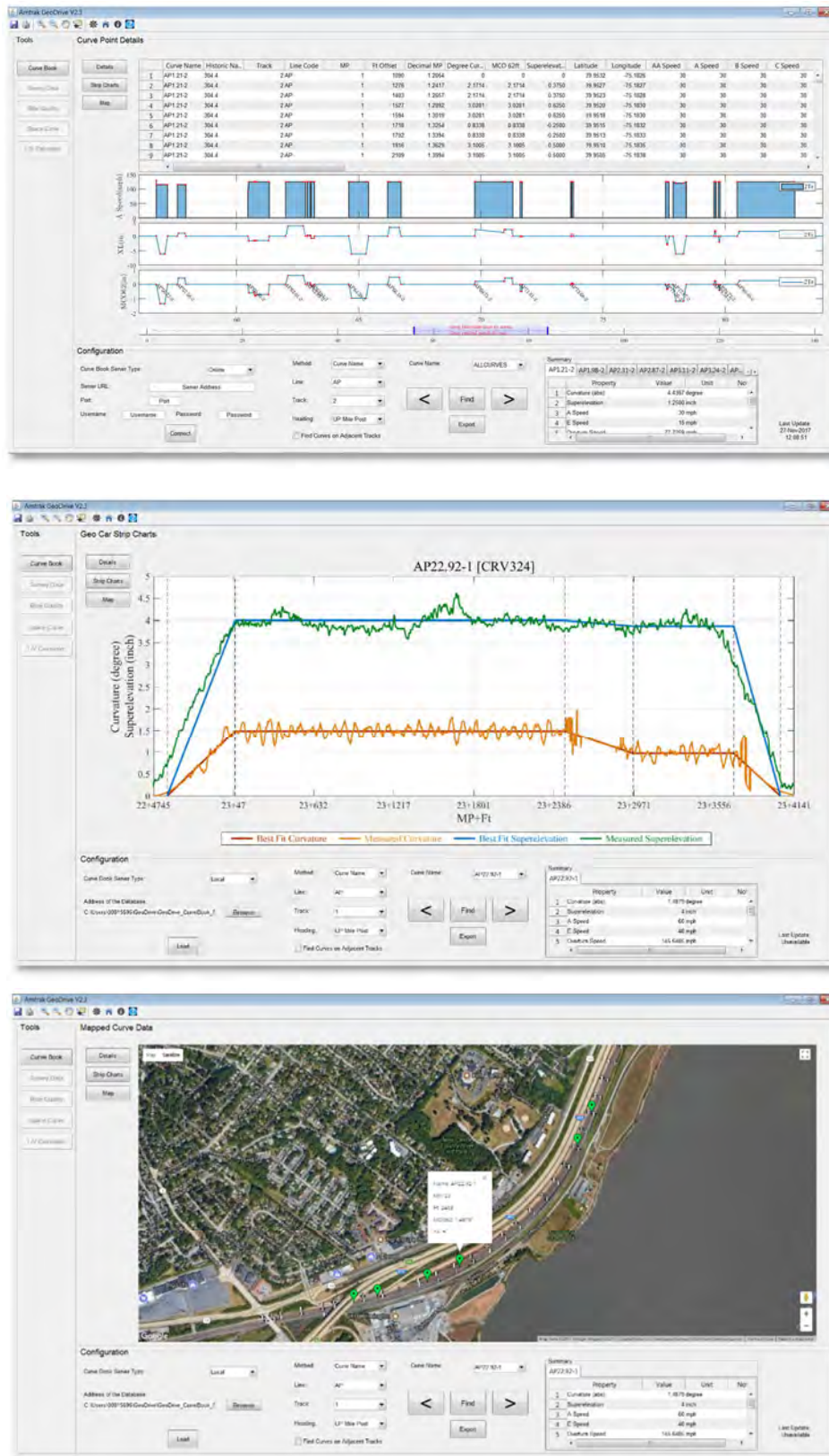


Figure 20: Screenshots of GeoDrive



Improving Work Plan and Budget Forecasting

Operating Expenditure Forecasting

A key challenge across Amtrak Engineering is that the record of activities performed (including fault rectification) and the cost of performing the activity is not captured at sufficient detail to support activity-based costing. Even in areas where there is a stronger record of activity – costs are not captured at the asset-level. Thus, the opportunity to model activity costs and to forecast likely future expenditures based on the needs of the asset (and therefore the changing needs of activity on the asset) is a challenge.

To address this Amtrak Engineering recently introduced an initiative to eliminate large ‘bucket’ work orders. The first step of this initiative is to introduce work order categories which will enable better reporting and decisions.

Our long-term plan, is to improve the activity-based costing capability. The updated CMMS will, at the very least, capture resources against work orders.

Improving Reliability

Improving reliability has been a focus of Amtrak Engineering through 2018. Historically tracked through daily reporting, morning reports, C&S trouble desk data – the Engineering Operations Desk began centralizing this information in mid-2017 and have been using the technology described above to inform reliability improvement action plans.

Following the delivery of I-AMP2017, Amtrak Engineering identified the top reliability priorities through an exercise of mapping all failure work orders to asset inventory data. Quarterly action plans have been developed to address the top issues within each asset class. The approach has used the GIS and Geospatial Decision Support Tool identified in Table 12 and presented in Figure 18 to enable the mapping of multiple data sets.

Capital Expenditure Forecasting

In addition, the longer-term need for capital replacement and improvement is not well defined. This is in part due to funding uncertainty over necessary mega-projects, but also due to the lack of knowledge of the state of the asset and its longer-term replacement/overhaul/capital maintenance need.

Further developing the lifecycle strategies as laid out in the previous section to consider the decision criteria for capital expenditure (including for example condition assessment) and modeling that to determine future capital need is considered a necessary key improvement action to support improved confidence in the infrastructure asset management plan.

The initiative is being led by the Chief Engineer and supported by the Engineering Business Improvement Team. Delay minute reduction targets are now established for each asset class.

In continuing the development of this data analytics process, Amtrak recently scored the reliability of all asset inventory on a 1-5 scale (with 1 being worse). The scoring is based on incidence/minutes and normalized by assets in the location. The worst asset in the location then receives a higher priority in the capital program. This process is being introduced for the FY2020 construction program which is currently under development.

Risk Management

IALP2019 continues the introduction of risk management to support decision making, planning and prioritization. Amtrak plans to continue developing its approach to infrastructure risk management through the planning period 2020 to 2024.

Overview

The FAST Act requires that both asset and asset management risks are captured to inform investment prioritization and establish implementation strategies.

Currently, risk management occurs across the Engineering Department and is highly focused on maintaining a safe and reliable infrastructure. Amtrak recognizes that the effective management of risk is also critical to achieving its corporate objectives. Amtrak also acknowledges the lack of risk analysis, evaluation and management processes for managing longer-term and non-safety risks (e.g., future risk of service disruption or of a component becoming obsolete). Further, Amtrak does not have an established, formal enterprise risk management framework. Risk registers are typically neither developed nor maintained across the organization.

This section outlines our approach to risk management (including both threats and opportunities). As part of I-AMP2017 development, Amtrak conducted a risk identification exercise for infrastructure asset and asset management practices. The risks identified are reported in the asset plans located in the appendices of this document. Described below are our current asset-risk control activities and risk management framework. Our principal risks are outlined in the [Infrastructure Asset Management Risk Register](#) in Table 12.

Current Risk Management Activities

Amtrak's Engineering Department currently employs the following asset risk control activities:

- **A focus on safety:** Safety remains a top priority for Amtrak senior management and staff. Safety briefings consistently reinforce this top priority. Amtrak's Engineering Department performs well on Federal Railroad Administration (FRA) safety audits.
- **Applying engineering standards:** The primary approach to managing asset safety and reliability risk is through a comprehensive inspection and condition monitoring program. All asset classes have established inspection regimes, some mandated by Federal Railroad Administration regulations. Inspection practices identify actual and potential asset failures and enable us to prioritize repair. Amtrak maintain records of inspection compliance and monitor completion of inspections as a monthly reviewed key performance measure.
- **Focusing on asset reliability:** Through daily, weekly and monthly management reporting (see the Asset Management Practices section), Amtrak maintains a focus on identifying and resolving reliability issues. The reporting framework utilizes the problem-cause-remedy approach which considers how the asset failed, what caused the failure and how it was remedied. This approach is currently addressing immediate concerns. In 2019 we intend to continue developing this methodology to identify preventive actions (problem-cause-remedy-plan).
- **Maintaining asset integrity:** Our capital program is focused on maintaining asset integrity within imposed financial constraints. This includes both capital maintenance (rehabilitation) and renewal of assets, both of which focus on addressing known condition concerns. Our work program focuses on decelerating asset deterioration, rectifying asset defects and restoring asset performance.
- **Improving asset performance:** Aspects of our capital program are focused on opportunities to

improve asset capabilities, thereby allowing us to increase asset performance.

- **Reducing asset vulnerability and safety risk:** Our capital program considers assets that may be vulnerable to certain hazards and/or pose an operational risk (or pose an opportunity for reducing safety risk).
- **Planning for incident response and recovery:** Our Department management teams ensure that there are procedures in place for effective response to incidents and emergencies across Amtrak owned/managed infrastructure.

Risk Management Process

The **2016 Asset Management Capability Assessment** identified risk management as a focus area for improvement. Through I-AMP2017, Amtrak introduced processes for risk identification and treatment. This was further updated during 2018 as part of IALP2019 and will continue to be developed during the asset plan period.

Our planned approach is aligned to ISO 31000⁵, as described in Figure 21 and in the following sections.

Establishing the Context

Establishing the context defines the basic parameters for risk evaluation and determines scope for the rest of the risk management process, focusing on a specific area. Amtrak use five risk categories:

1. **Corporate risks** – are associated with the ability of Amtrak to meet its goals and objectives. They include external risks (outside of Amtrak Engineering's control) related to government policy, funding sources, legislative requirements, external stakeholders (NECC and other infrastructure users) and industrial relations risks (related to collective bargaining agreements). At this level, risks are owned by Amtrak Executive.
2. **Financial risks** – are related to Amtrak Engineering's operating and capital budgets – including cost of ownership and demonstrating

value for money. At this level risks are owned by Amtrak Engineering management.

3. **Organization risks** – are related to Amtrak Engineering's ability to manage assets and deliver infrastructure services, this includes risks associated with resource capability, competence and capacity. At this level risks are owned by Amtrak Engineering management.
4. **Asset management risks** – are associated with Amtrak Engineering's ability to efficiently and effectively manage the infrastructure and include managing track access (outage), equipment and plant, policies, practices and procedures, information quality and accessibility and technology capability. At this level risks are owned by Amtrak Engineering Deputy Chiefs.
5. **Asset risks** – are the known concerns managed by Amtrak Engineering and include specific concerns, state of good repair concerns, inherent reliability, maintainability, local environmental risks, supply chain risks and obsolescence. At this level risks are owned by Amtrak Engineering Deputy Chiefs.

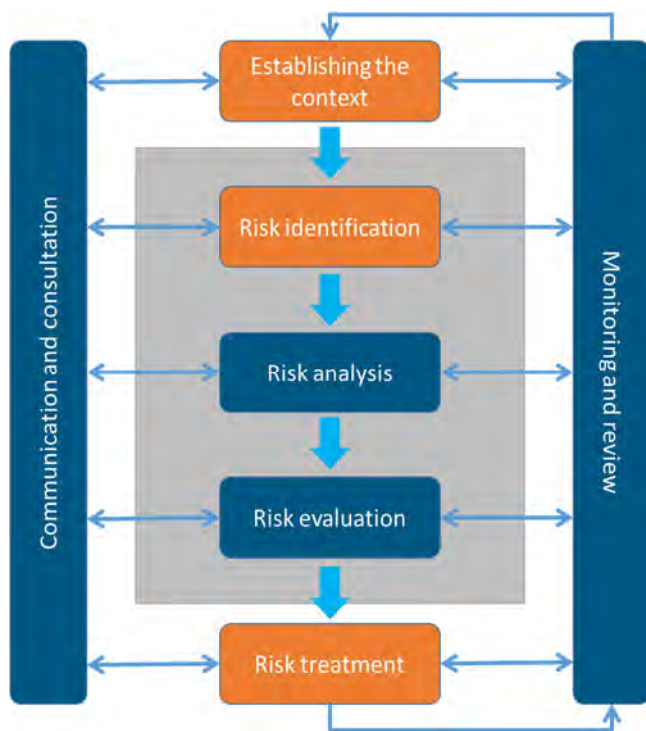
Note: An extensive safety risk assessment was not conducted as part of this exercise.

Risk Identification

Risk identification is the process of finding, recognizing and describing risks. Risk identification is a systematic and continual process to maintaining an up-to-date view of risks. As part of introducing improved risk management processes, Amtrak conducted risk management workshops with each of the Deputy Chief and their subject matter experts. This exercise has resulted in an initial risk register (see appendices). We intend to continue this exercise in 2019 through workshops with divisional managers and other key stakeholders. We also propose developing risk identification processes to enable more frequent maintenance of the risk register through existing reporting mechanisms.

⁵ ISO 31000: 2009 – Risk Management – Principles and guidelines.

Figure 21: Amtrak PROPOSED Risk Management Process



Source: ISO 31000:2009 Risk Management Process Diagram. Phase 1 has been introduced as part of I-AMP2017 and updated as part of I-AP2019 (highlighted). Phase 2 will be developed through the asset plan period.

Risk Analysis and Risk Evaluation

Risk analysis and risk evaluation will be introduced in phase 2 of our planned introduction to a risk management framework. Risk analysis is the process used to determine the nature and level of risk; evaluation compares the results of the analysis to determine whether the risk is tolerable or acceptable. Risk-consequence, -likelihood and -magnitude ratings will be established as part of the phase 2 development.

Risk Treatment

Risk treatment involves selecting one or more options for modifying the risk to tolerable levels. Amtrak's approach to risk tolerance is immature and an area identified for further development. As part of the introduction of an improved asset risk

management framework in 2018, our risk tolerance will be defined based on asset criticality.

Best practice risk management considers one or more of four typical strategies (see list below). We have captured our current or proposed risk treatment strategies in the risk registers located in the appendices.

1. **Risk prevention** – is directed to eliminating sources of risk or substantially reducing the likelihood. Examples may include engineering and/or design changes, quality assurance procedures, operations and use changes, and regular asset inspections.
2. **Impact mitigation** – is directed to minimizing the consequences of risk. Some risks such as weather cannot be avoided. Risk management should therefore be directed at coping with the impacts. Examples may include contingency planning, regular asset inspections and in some instances, design changes (e.g., increased weather protection).
3. **Risk transfer** – is directed at shifting the responsibility for the risk to another party, who ultimately bears the consequences if the risk arises. Examples include insurance, procurement and contracting. Most examples will require decisions in the early life of the asset – usually in the Concept and Specify stages.
4. **Risk acceptance** – occurs when risks cannot be avoided or transferred, or the cost benefit would not be worthwhile. Risks must then be accepted, but not ignored. A program of monitoring should be established.

Risk Monitoring, Management and Communication

Regular monitoring, reviewing and reporting is an important part of the risk management process, as it ensures that new risks and changes to existing risks are identified and managed.

In the first instance, risks identified in IALP2019 will be reviewed and updated by the Deputy Chief Engineers as part of their **monthly asset**

performance review meetings (see Asset Management Practices section). Further review points will be introduced as part of the phase 2 Amtrak Engineering Risk Management Framework during 2019.

Asset Criticality

Amtrak Engineering Department's Infrastructure Asset Management Policy includes the principle "Risk management (criticality) is used to inform the asset management decision-making process." This will be achieved by optimizing the timing of maintenance and renewal interventions and ensuring full-use is made of all track outages.

To provide further guidance for asset maintenance and renewal decision-making, Amtrak will align its approach to ranking asset criticality to its improved asset risk management framework. Criticality will be based on several factors, including:

- The degree to which the failure of the asset would impact the safe and efficient operation of the infrastructure (especially assets that are necessary for safety, regulatory or efficiency reasons)
- The asset's location or functional significance within the network, considering track class, traffic volume and services impacted (Amtrak and other users)
- Other factors such as the potential, should the asset fail, for it to damage or disrupt other infrastructure or property—or damage the environment—and the cost of repairing the asset.

Introducing Criticality to Construction Programming

In 2018 Amtrak introduced criticality analysis to refocus maintenance prior to track outages to support improved performance through the planned outage. Following the completion of the construction program, Transportation identify critical interlockings necessary to maintain

performance through the outage. Engineering then use this information to direct work forces to undertake preventive maintenance to ensure reliable service can be maintained through the outage.

This effort will continue to be developed during 2019.

Risk Management Improvement Actions

Amtrak is currently establishing an improved risk management framework. We plan to continue to undertake risk reviews as part of the asset line planning process and to further introduce a risk management framework to manage the identification, monitoring and review of risks. This will be introduced during the plan period.

Risk Register

The risk register provided in the appendices has been captured through consultation with Amtrak's Deputy Chief Engineers. Risks have been identified and where possible, management actions have been established. Risks have not been graded against a corporate standard consequence-likelihood-magnitude- factor scale. Amtrak plans to continue developing this through the course of 2019, including further consultation with Engineering Division staff.

Table 12 below provides a summary of the major risks identified in each asset class well as the common risks across Engineering. Risks are grouped in the categories identified above. The service objective(s) – from the Asset and Asset Management Performance section impacted by the risk are also noted.

Table 12: Infrastructure Asset and Asset Management Risk Register

Ref:	Risk description	Risk impacts (service objectives)	Existing/ planned control
Corporate Risks			
Eng001	Need for multiple parties commitment and agreement on project outcomes, results in mega projects being slow to develop, are not fully funded and impacts Amtrak's ability to provide reliable infrastructure and improve network performance. (BB002)	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 5. Improve Network Performance	→ No actions planned.
Eng002	Involvement of external stakeholders in identifying project priorities, results in necessary repairs and rehabilitation being delayed – decreasing the SOGR and impacts Amtrak's ability to provide reliable infrastructure.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 5. Improve Network Performance	→ No actions planned.
Eng003	The level of effort required by Amtrak Engineering to obtain funding commitment is not comparable to other transportation systems – where the carrier does not normally engage in funding issues. This is time-consuming, and does not assist with moving the project forward. (BB003)	2. Obtain funding and financing for infrastructure investment	→ No actions planned.
Eng004	Labor agreements allow senior staff to 'bid-out', which results in a lack of qualified staff filling roles and impacts Amtrak ability to deliver maintenance efficiently. (TK006, BB005, ET005)	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Reexamine labor agreements to improve ability to retain qualified staff and decrease qualified staff bidding out for other jobs.
Eng005	Introduction of increased services (commuter and Amtrak), results in a reduction of time available for maintenance, an increase in the rate of deterioration of assets and impacts Amtrak's ability to provide reliable infrastructure and deliver network performance improvements.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Establish a review to understand operational and maintenance impact from increased services.

Financial Risks

Eng006	Lack of project funding, results in deteriorating assets that do not meet service requirements and impacts Amtrak's ability to provide safe and reliable infrastructure and improve network performance. (BB001)	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 5. Improve Network Performance	→ No actions planned.
Eng007	Major projects require additional real estate for staging, results in increased costs for capital projects and impacts Amtrak's ability to obtain funding. (BB004)	2. Obtain funding and financing for infrastructure investment	→ No actions planned.
Eng008	Existing General Ledger accounting structures, results in a lack of activity based cost information and impacts Amtrak's ability to make whole-life-cost based decisions.	2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery	→ No actions planned.

Organization risks

Eng009	Insufficient engineering resources available, results in reduction in ability to address preventive maintenance needs and impacts Amtrak's ability to provide a reliable infrastructure. (TK001, TK005, ET001, ET002, CS001, CS002)	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Review resource needs as part of wider Engineering Division resource study. → Planned: Develop a robust resource plan, identify gaps and establish a strategy for attracting and retaining staff in key roles. → Planned: Explore ability to supplement Amtrak forces with contractors.
Eng010	Staff attrition (including imminent retirement) results in reduction of qualified and experienced engineering resources and impacts Amtrak's ability to deliver work efficiently. (TK002, BB006, ET003, CS003).	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	→ Planned: Review resource needs as part of wider Engineering Division resource study. → Planned: Plan for impact of voluntary separation on Engineering resource levels.

Asset management Risks

Eng011	Failure to assess the service level requirements in the asset management plan, which results in misalignment between planned use of the asset and the capability of the asset and impacts Amtrak's	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 3. Manage implementation of agreements and adherence to the cost allocation policy	→ Current: Introduction of alignment in I-AMP2017. → Planned: Further development of alignment including alignment of service plans with commuter service agreements in 2018.
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	ability to improve network performance.	5. Improve Network Performance	
Eng012	Lack of consistency in processes across Engineering, results in inconsistent work practices and impacts Amtrak's ability to identify opportunities for improvement and recover from issues.	1. Provide safe and reliable infrastructure for train services	→ Planned: Improvements to our asset management capabilities as laid out in this I-AMP2017.
Eng013	Risks are not fully identified, which results in ineffective decision making and impacts Amtrak's ability to prepare long-term plans and deliver work efficiently.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment	→ Current: Introduction of alignment in I-AMP2017. → Planned: Improvements to our asset management capabilities as laid out in this I-AMP2017.
Eng014	No central coordination of work and poor advanced planning of outages, results in inefficient use of track time, planned work not being completed and impacts Amtrak's ability to deliver maintenance efficiently. (TK007, TK011)	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Improve advanced planning of track outages along with coordination across Engineering disciplines. → Planned: Establish a mechanism to improve coordination with Transportation to better understand constraints on outages. → Planned: Consider increasing overnight outage durations. → Planned: Stage/store equipment closer to work locations.
Eng015	Limited Track Outage Time, results in less work being completed inefficiently and impacts Amtrak's ability to provide reliable infrastructure and improve network performance. (TK010)	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Review opportunity to cancel last 10PM train to allow more track access. → Planned: Review need for long-term (50+) outages for major projects. → Planned: Seek agreement/clarity/ transparency regarding track outage scheduling constraints.
Eng016	Poor quality and missing information (including data attributes, data structures, information about certain assets, site characteristics and asset configuration), and a	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery	→ Current: Capital programs informed by local knowledge that drives prioritization for replacement.

	lack of information on the condition of the asset results in ineffective decision making and impacts Amtrak's ability to prepare long-term plans and deliver work efficiently. (TK008-009, BB008, ET007-009, CS006-008)		<ul style="list-style-type: none"> → Planned: Asset registry improvement activities as identified in this plan. → Planned: Introduction of a condition assessment program in 2018, will enable Amtrak to better monitor the rate of deterioration and justify additional funding to address the backlog.
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Asset risks (MAJOR and common risks only)

Eng017	Reliance on third parties for supply of power, access to assets, and interfaces with third parties who have assets on Amtrak property results in increased risk of unforeseen failure and impacts Amtrak's ability to provide reliable infrastructure services. (ET010, ET011, ET013, ET015, ET019, ET020)	<ol style="list-style-type: none"> 1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 	<ul style="list-style-type: none"> → Planned: Review maintenance schedules and asset management plans with third parties, to confirm reliability.
Eng018	A history of underinvestment and the age and condition of many of the Amtrak infrastructure assets, results in a substantial SOGR backlog with a high degree of obsolescence, poor maintainability and impacts Amtrak's ability to provide reliable infrastructure and to improve network performance. (TK017, BB010-BB016, ET016-017, CS009-014, CS016)	<ol style="list-style-type: none"> 1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 3. Manage implementation of agreements and adherence to the cost allocation policy 5. Improve Network Performance 	<ul style="list-style-type: none"> → Current: Inspections identify highest risk assets, which are included in the capital program. Focus of the current FY2018-FY2022 capital plan is to address SOGR issues. → Planned: Introduction of a condition assessment program in 2018, will enable Amtrak to better monitor the rate of deterioration and justify additional funding to address the backlog.
Eng019	Unexpected failure of critical assets results in unforeseen capital or renewal expenditure and impacts Amtrak's ability to maintain a delivery plan, commit resources to other needed asset activities and provide a safe and reliable infrastructure.	<ol style="list-style-type: none"> 1. Provide safe and reliable infrastructure for train services 	<ul style="list-style-type: none"> → Planned: Introduction of a condition assessment program in 2018, will enable Amtrak to better monitor the rate of deterioration and justify additional funding to address the backlog.

Improvement Plan

This section provides a summary of the key improvement actions highlighted in IALP2019. An overview of the 2018 am²c capability assessment is provided with current position and 2020 target position scores. An Asset Management Improvement Program – Roadmap – is presented.

Overview

In 2016, Amtrak undertook an Asset Management Capability Assessment using the WSP am²c assessment model. This assessment identified a series of improvement recommendations which have been developed into an Asset Management Improvement Program or Roadmap, designed to improve current practices

Through the course of developing IALP2019, several improvement actions have been captured throughout the document.

In the following sections, we have captured the output and overall findings from the 2018 assessment, collated the improvement actions identified in IALP2019 and provided an updated roadmap and target position for 2020.

It is Amtrak's intention, as part of its commitment to continually improving its asset management capabilities, to conduct a further capability assessment in 2020 to be included in the February 15, 2021 submission.

2018 AM Assessment

Assessment approach

The assessment has been undertaken using WSP's industry leading Asset Management Capability Assessment Model (am²c) that draws on over twenty years of experience in managing critical infrastructure. The model is mapped to global standards, industry best practices and Federal FAST Act requirements for asset management.

The model provides an assessment of an organization's asset management maturity. Its output is used to evaluate and benchmark an organization and support the development of an Asset Management Improvement Program. This approach ensures consistent and repeatable assessment and provides access to a significant global benchmark pool.

Assessment Criteria

Organizations are assessed against 265 questions which describe the broadest scope of activities (subjects) that should be considered when optimizing the management of assets. The subjects are grouped into eight assessment areas or Pathways which describe specific operational processes for asset management success – these include:





The **Alignment to Organizational Goals** pathway assessed the extent to which Amtrak Engineering has processes and procedures in place to provide clear management direction and minimize disconnects in alignment between stakeholder needs, business strategies and goals and the activities and decisions that contribute to asset management outcomes.



The **Control of Assets** pathway assessed the extent to which Amtrak Engineering has established policies and procedures to ensure it reliably achieves its objectives, while managing risks and uncertainty and demonstrating compliance to standards. Good practice asset management organizations are able to demonstrate an overall business framework that ensures all activities are undertaken consistently and harnessed toward the delivery of service and business objectives.



The **Asset Management Planning** pathway assessed the extent to which Amtrak Engineering has put in place processes and practices to establish strategies for the most appropriate intervention activities and that result in work plans to efficiently deliver performance improvement and effectively manage risk.



The **Capital Planning and Delivery** pathway assessed the extent to which Amtrak Engineering has processes and procedures in place to ensure capital expenditure is optimized to support delivery of the organization's strategic goals and are effectively prioritized. The pathway also considers the management and delivery of capital projects.



The **Maintenance Planning and Delivery** pathway assessed the extent to which Amtrak Engineering demonstrates

clearly-defined processes for the definition, planning and delivery of maintenance activities. It also considers the organization's approach to asset inspection and assessment.



The **Operations and Incident Management** pathway assessed Amtrak Engineering practices related to asset operations and the capability of the organization to identify, respond to and manage asset incidents. The pathway also considers the processes related to business continuity planning in the event of an incident.



The **Informed Decisions** pathway assessed the extent to which Amtrak Engineering has established requirements for, developed, maintained and provided access to asset and asset management-related information to support whole life decision-making.



The **Resource Capabilities** pathway assessed the extent to which Amtrak Engineering understands resource requirements and has established an organization that is aligned to delivering the asset management activities to ensure it successfully achieves its organizational goals.

2018 – Overall Findings

Amtrak Engineering's asset management capability currently scores at the **ESTABLISHING** level, as shown in Figure 22. This is typical when compared nationally to other rail and transit agencies that are actively developing their capabilities and addressing performance and asset condition risks and other challenges through improved use of information systems, consistent work practices and better asset knowledge.

In the 24 months since Amtrak were first assessed, a number of improvements have been made, notably through efforts to comply with FAST Act requirements. These have included:

- The introduction of the **Strategic Pillars** has established business goals and objectives that the organization is now very focused on.
- Amtrak's Senior Management Team authorized the **Asset Management Policy** which has provided direction for strategic and asset management planning.
- The FAST Act has required Amtrak to establish **Asset Strategies** that define decision criteria and the principal methods for managing assets. These were introduced in 2017 and reviewed and updated in 2018.
- During the last 24 months, considerable effort has been made to introduce revised **performance management** reporting – to focus Engineering attention on the most needed assets to increase reliability and performance.
- The biggest area of improvement has been through the introduction of the **asset management plans / asset line plans** – which were introduced in 2017 and updated in 2018 for FRA submission in February 2019. The process of developing, reviewing and updating the plans has identified further opportunities for improvement, but, importantly, has also highlighted further challenges with performance, and Amtrak's ability to deliver

Steady State production units. The planning effort in 2017 has supported the acquisition of new equipment and negotiation for increased shift patterns and improved track access.

- Reliability analysis is a further area of significant improvement. As identified in the Improving Reliability section above, a focus on high impact faults with quarterly action plans is enabling Amtrak Engineering to improve their contribution to on-time-performance.

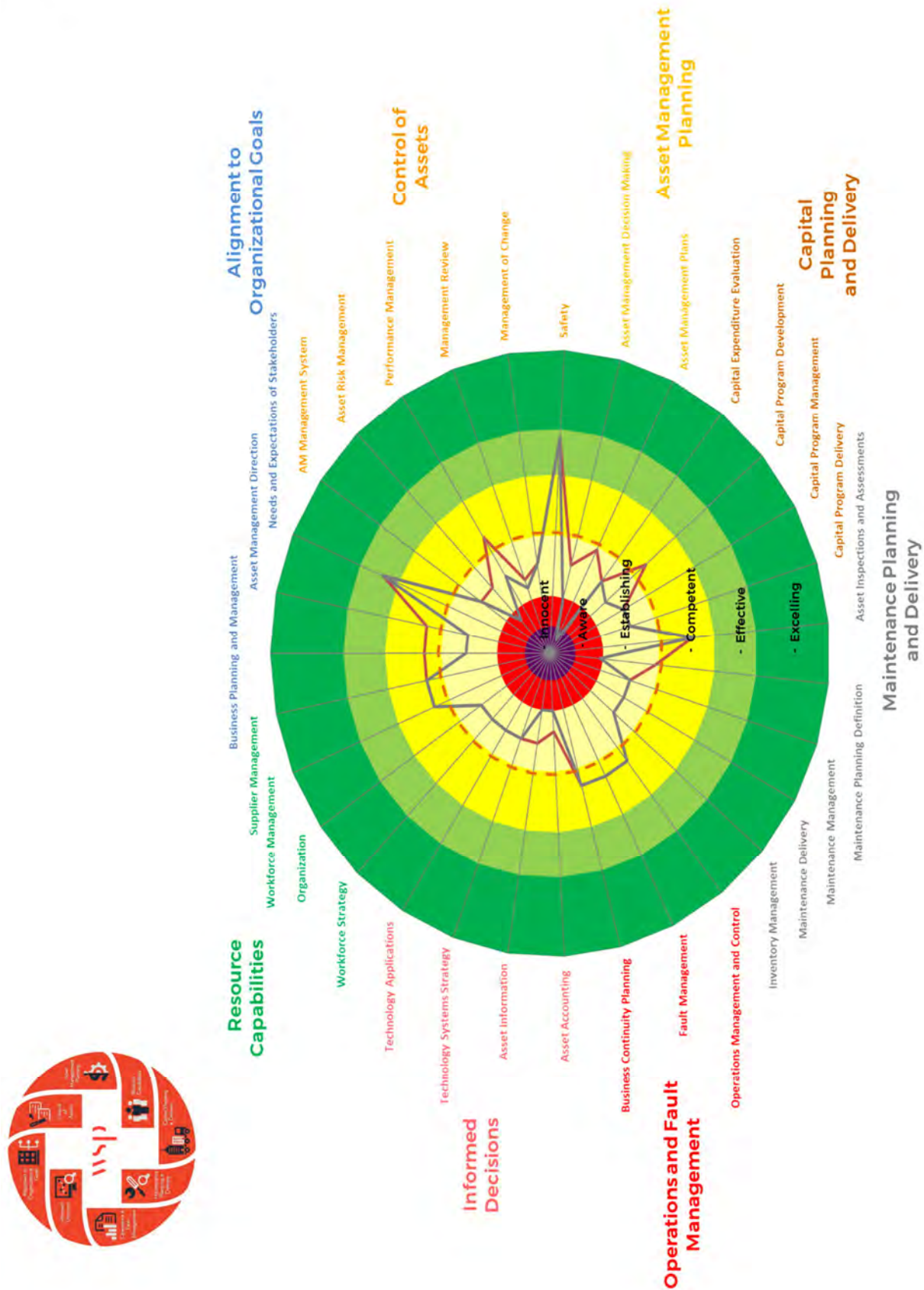
For Amtrak Engineering there are several immediate key challenges that the organization needs to address. These include:

- Asset information continues to be a challenge. Amtrak's systems for maintaining asset and asset activity related information are poorly connected resulting in considerable effort to link data sets to support reliability analysis and other initiatives.
- Project cost information is not captured to the extent required to support life-cycle cost analysis. Current replacement costs require a level of analysis that is difficult to monitor project efficiency through.
- Funding for SOGR backlog and strategic initiatives remains a challenge. The significant backlog – particularly with structures – increases the challenge in improving the geo-specificity of projects – as forces and equipment are typically diverted to the emerging need.

Improvements identified in 2017 have been updated and presented in the following section (see Table 15).

The chart on the following page provides a comparison between our 2016 score (blue line) and our 2018 score (red line).

Figure 22: Amtrak Engineering - Assessed Asset Management Capability using the WSP am2c assessment model











2018 Pathway Scores and Target for 2020

Table 13 shows Amtrak's assessed scores at the Pathway level. The 2016 assessed position is broadly in line with the position just prior to the publication of I-AMP2017. The 2018 assessed position is reported for the IALP2019 plan. The 2020

target position is established based on Amtrak's priorities to be adopting good-industry practice and developing its capabilities in line with its asset management policy.

Table 13: Amtrak Engineering - Pathway Scores – Previous, Current and 2020 Target

Pathway	2016 Assessed Position	2018 Assessed Position	2020 Target Position
 Alignment to Organizational Goals	Establishing	Competent	Competent
 Control of Assets	Establishing	Establishing	Competent
 Asset Management Planning	Aware	Establishing	Effective
 Capital Planning and Delivery	Establishing	Establishing	Competent
 Maintenance Planning and Delivery	Establishing	Establishing	Competent
 Operations and Incident Management	Competent	Competent	Competent
 Informed Decisions	Establishing	Establishing	Competent
 Resource Capabilities	Establishing	Establishing	Establishing

Key Improvement Actions from IALP2019

Table 14 presents the Key Improvement Actions identified I-AMP2017 and updated through the development of IALP2019. Improvement actions are continuously numbered from I-AMP2017. New improvements are identified in bold. Improvements are grouped by document section.

Table 14: Key Improvement Actions

Ref:	Key Improvement Action	Responsibility	Date
Asset and Asset Management Performance			
001	Further develop Amtrak's Five-Year Service Line Plans, capturing customer level-of-service targets for infrastructure performance, and align with service agreements with Amtrak Transportation and other users of (commuter and freight) Amtrak's infrastructure.	Vice President, Corporate Planning	Updated to Q3 FY 2019
002	Align Amtrak's five-year corporate strategy, Five-Year Service Line Plans and the asset management plans, to establish a clear, common purpose.	Vice President, Corporate Planning	Updated to Q4 FY 2019
003	Further develop asset performance measures that align to customer levels of service for infrastructure service and provide specific performance targets for each asset class – recognizing the required change in performance to meet service goals over the next five years.	Senior Director Business Improvement	Updated to Q4 FY 2019
004	Further develop asset management performance measures that reinforce the focus on planning and productivity within each asset class.	Senior Director Business Improvement	Updated to Q4 FY 2019
005	Development of a Performance Dashboard for ongoing monitoring and reporting of asset and asset management performance against required levels of service.	Senior Director Business Improvement	Updated to Q3 FY 2020
Asset Management Practices			
036a	Develop a Strategic Asset Management Plan that sets out the blueprint for how Engineering will manage infrastructure – including meeting all requirements and aligning planning cycles	Senior Director Business Improvement	Q2 FY 2019
036b	As part of the SAMP establish the asset management organization capability requirements	Senior Director Business Improvement	Q2 FY 2019
036c	Undertake organization change impact assessment and establish implementation plan for SAMP	Senior Director Business Improvement	Q3 FY 2019
036d	Update to SAMP following development of Amtrak Asset Management management system	Senior Director Business Improvement	Q4 FY 2020
006	Further develop existing Engineering standards into an Asset Management – management system (asset management framework). Aligned to global best practices and consistent with the requirements under the FAST Act.	Senior Director Business Improvement	Updated to Q3 FY 2020

006b	Update capital planning process as part of the development of the Asset Management management system – to include full alignment to the FAST Act	Senior Director Business Improvement	Q3 FY 2020
006c	Develop position descriptions and competency requirements for all roles identified in the Asset Management management system	Senior Director Business Improvement	Q3 FY 2020
007a	Implement a quality assurance process to ensure that processes and procedures are followed and provide confidence that “we do what we say we do”.	Senior Director Business Improvement	Updated to Q3 FY 2019
007b	Review and revise current work execution documentation and signoff procedures to enhance current quality control efforts	Senior Director Business Improvement	Updated to Q3 FY 2019
007c	Identify and introduce QA/QC resources	Senior Director Business Improvement	Updated to Q3 FY 2019
008	Document the processes for managing asset management planning and ensuring it is integrated into other business planning processes – including maintenance and capital budgeting.	Senior Director Business Improvement	Updated to Q2 FY 2019
009	Review and further development of the track outage process – including review of opportunities to re-engineer the current process to provide improved planning to enable better use of track access time. This will include developing processes to deliver better ‘piggybacking’ of track access.	Senior Director Business Improvement	Updated to Q3 FY 2019
010	Establish a cost capture model for all maintenance and renewal activities at the asset level – which includes review and development of a revised G/L structure.	Finance	Updated to Q4 FY 2020
011a	Document the Infrastructure Digital Strategy which sets out the organizational capabilities, asset information requirements and technology solutions to enable Amtrak meet all needs	Senior Director Business Improvement	Q2 FY 2019
011b	Development of an asset information standard to ensure that ongoing improvements to Maximo and other asset management technologies are configured to align to the needs of the business and that the requirements for consistent, accurate data collection are understood.	Senior Director Business Improvement	Updated to Q3 FY 2019
012	Plan and implement the upgrade of Maximo to version 7.6, to include enabling addition functionalities within Maximo as well as completing integration with geospatial and geoschematic tools currently under development.	Senior Director Business Improvement	See below for revised schedule
012a	Document the business requirements for Maximo 7.6	Senior Director Business Improvement	Updated to Q3 FY 2019
012b	Procurement of Maximo 7.6 Principal System Integrator	Procurement	Updated to Q4 FY 2020

012c	Implementation of Maximo 7.6 and related integrations	Senior Director Business Improvement	Updated to Q3 FY 2021
013	Plan and implement Maximo Anywhere as a mobile (field-working) application to enable data access and entry within the field.	Senior Director Business Improvement	Updated to Q3 FY 2019
040	Complete development of Product Lifecycle Management (PLM) application to support configuration control and QA	Senior Director Business Improvement	Q4 FY 2019
014	Plan and implement the Asset Registry Planning Tool to provide support to the DCE's for future asset management planning.	Senior Director Business Improvement	Updated to Q4 FY 2020
015	Review purchase action lead times and develop procurement plan aligned to asset management plan.	Procurement	Updated to Q4 FY 2021

Asset Inventory

016	Review and further improve the current asset registry information for all assets in line with the gaps identified in the appendices – in time for inclusion in future infrastructure asset line plans.	DCE (All assets classes)	Updated to Q1 FY 2021
017	Complete the development of the asset class condition assessment framework.	DCE (All assets classes)	COMPLETE
018	Establish plan for implementation and roll-out across all divisions.	DCE (All assets classes)	IN DEVELOPMENT
019	Undertake a condition assessment of all assets utilizing the updated condition assessment framework.	DCE (All assets classes)	Updated to Q1 FY 2021
020	Establish a review of condition data to establish asset deterioration rates to enable better predictive analysis	DCE (All assets classes)	Q2 FY 2021
039	Develop revised asset transition processes that include the timely capture of asset information	Senior Director Business Improvement	Q4 FY 2019

Risk Management

021	Undertake further risk identification workshops with divisional managers and other areas of Amtrak Engineering Department to complete the initial risk identification exercise – establish a 'known concerns' log.	Senior Director Business Improvement	Updated to Q3 FY 2019
022	Introduce risk management reviews as a requirement at the monthly asset performance review meeting.	Senior Director Business Improvement	Updated to Q4 FY 2019
023	Further develop the problem-cause-remedy reporting to introduce planning and identify preventive measures.	Senior Director Business Improvement	Currently UNDERWAY

024	Progress phase 2 development of the Amtrak Engineering Risk Management Framework, including development of a risk management policy, governance framework, roles and responsibilities, risk assessment processes, reporting and escalation processes.	Senior Director Business Improvement	Updated to Q4 FY 2020
025	Update of risk register following further development of risk management procedures in FY 2019	DCE (all asset classes)	Updated to Q4 FY 2019
026	Regular update of risk register during completion of condition assessment of all assets and before second asset management plan.	DCE (all asset classes)	From Q4 FY 2019
027	Further develop and introduce an asset criticality framework. Define the scope and criticality assessment factors, and update the Asset MASTER list to consider criticality.	Senior Director Business Improvement	Updated to Q4 FY 2019
028	Further develop risk identification to consider climate related risks and undertake a network-wide vulnerability assessment to establish the degree of safety, asset condition and operational risk related to severe weather events.	Senior Director Business Improvement	Updated to Q3 FY 2019

Lifecycle Management Strategies

029	Plan and undertake a maintenance strategy review of all asset classes (prioritized by criticality, utilization and location) to ensure the most appropriate strategy is in place for each asset	Senior Director Business Improvement and DCE's all asset classes	Updated to Q4 FY 2020
030	Develop capital evaluation and prioritization processes and procedures that require lifecycle cost analysis, consider full benefit/ costs and include risk and criticality assessment.	Senior Director Business Improvement	COMPLETE
031	Review and further develop the asset lifecycle strategies set out in the appendices. This should include further analysis of the strategy based on updated asset information and further analysis of the implementation of the strategies based on funding levels and addressing other issues (track access, resourcing etc.).	Senior Director Business Improvement	COMPLETE and ONGOING REVIEW
035 (ET ONLY)	Complete the update of ET policy and procedures	DCE ET	Updated to Q3 FY 2020

Work Plans and Budget Forecasts

006c	Update capital planning process as part of developing Engineering Asset Management management system – to include full alignment to FAST Act requirements	Senior Director Business Improvement	Q3 FY 2020
032	Further analyze and breakdown operating and capital costs to activities or groups of activities to support budget forecasting.	Finance	Updated to Q1 FY 2021
033	Long-term: Introduce Activity Based Costing across all asset classes and establish requirements for the updated EAM system to support this.	Finance	TBD

034	Establish lifecycle strategies and condition assessments as per other key improvement actions. Develop and introduce a whole life cost modeling capability to support capital planning and investment forecasting.	Senior Director Business Improvement	Updated to Q4 FY 2020
037a	Undertake briefing and preparation for development of the second asset line plan – including stakeholder engagement with NEC, other commuter rail providers and the FRA	Senior Director Business Improvement	Q2 FY 2019
037b	Develop the second Asset Line Plan before the end of FY2019 to meet the submission requirements of 49 U.S.C § 24320(a)(1) – that plans shall be submitted not later than February 15 of each year.	Senior Director Business Improvement	Q2 FY 2019
038	Develop documentation for new requirements for capital project information (in line with FAST Act) - briefing and launch	Senior Director Business Improvement	Q4 FY 2019

Improvement Program

An Asset Management Improvement Program has been developed that sets out a roadmap for Amtrak Engineering to achieve its target asset management capability state. The projects are grouped into the eight pathways defined earlier in this section.

The roadmap provides a six year look ahead – consistent with the timeframe for this asset plan. The overall program and the target asset management capability is achieved through four phases, with each phase providing benefits and a foundation for the subsequent phase.

The proposed first phase of work from 2019 through to end of FY 2020 is focused on standardizing work practices. Activities include defining and documenting standard processes and practices and continuing to build the organization capability. Preparation for Maximo 7.6 implementation - includes ensuring a record of all assets exist, data standards are in place and configuration of 7.6 is aligned to both Engineering and wider Amtrak/ industry requirements.

The second phase of work extends from FY2021 to quarter 3 of FY2022 and is focused on implementation. Activities include the implementation of Maximo 7.6 as a full EAM system, and associated tools and applications to support Engineering reliability analysis, capital planning and

forecasting and asset management planning. Full roll out and adoption of the standard processes and practices developed during phase 1 are also included.

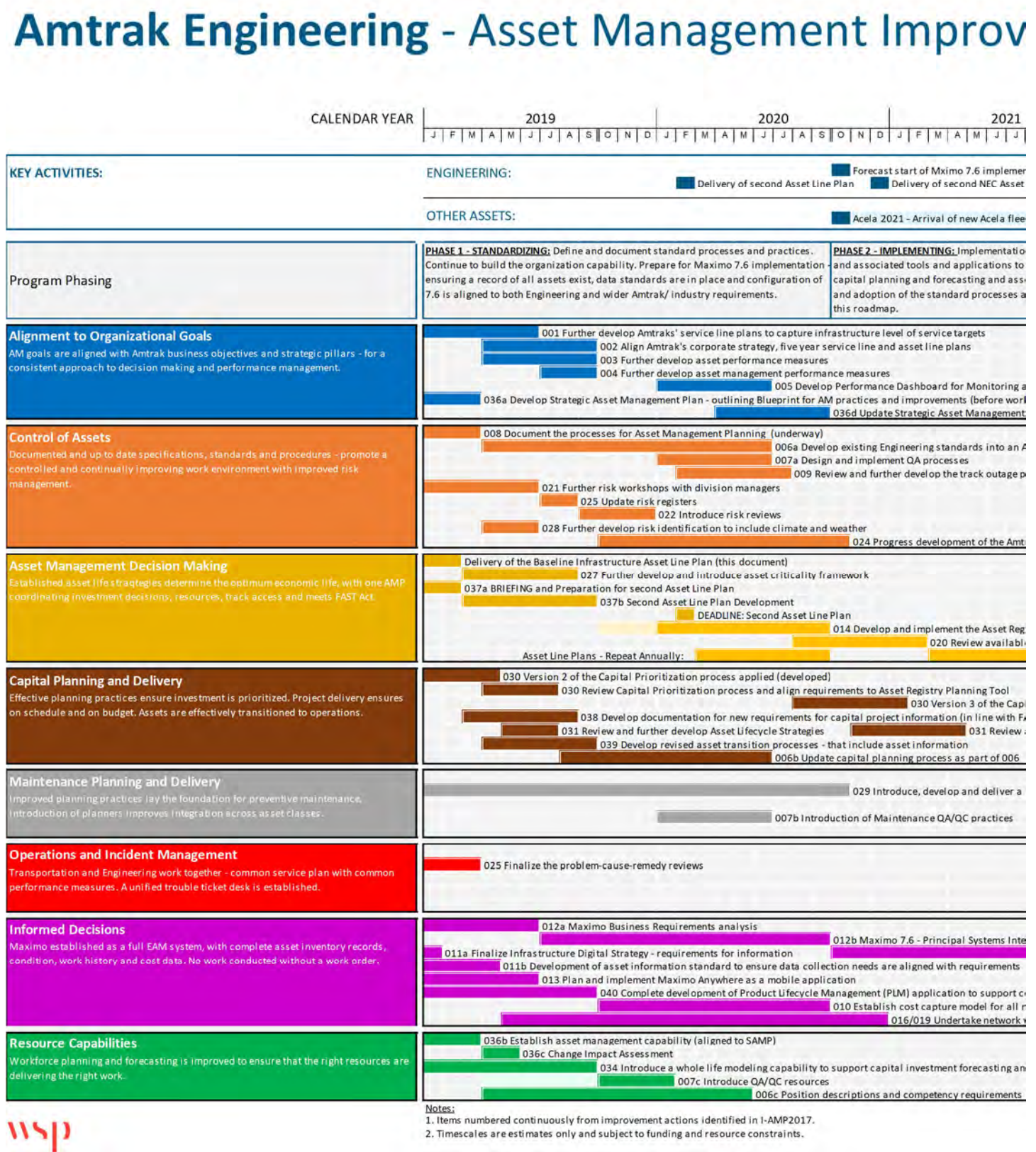
The third phase of work from quarter 4 FY 2022 through to the end of FY 2023 focuses on applying. With standard practices and EAM and other support tools in place, this phase focuses on applying and embedding practices across asset classes. We will continue to refine lifecycle strategies and continue to embed asset management planning as part of service commitment review and capital investment cycles.

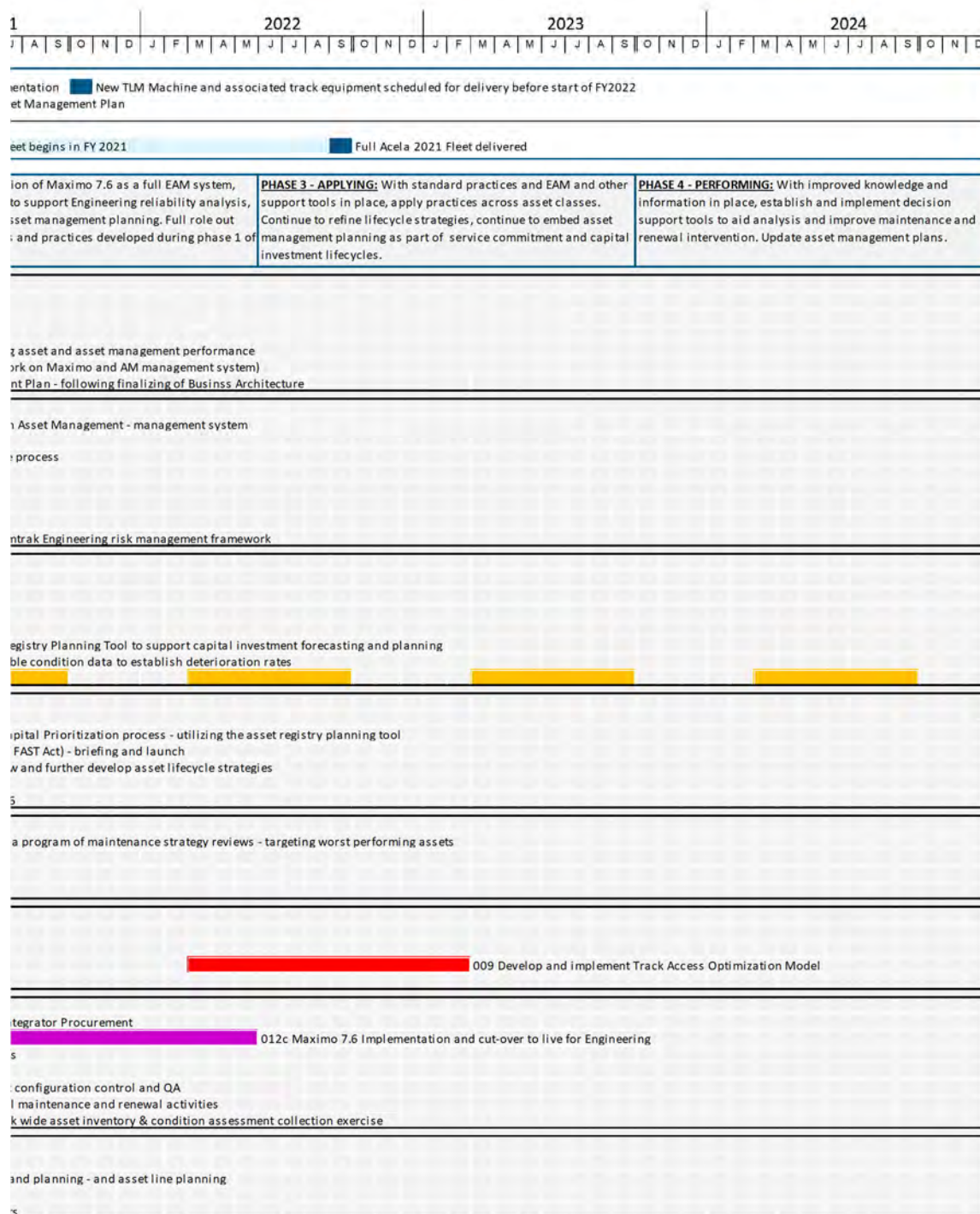
The fourth phase of work from FY 2024 focuses on performing. With improved knowledge and information available, established and implemented decision support tools to aid analysis, we will work to continue to improve performance through targeted maintenance and renewal intervention.

Roadmap

Schematic of the asset management improvement program appears on the following page (Figure 23).

Figure 23: Amtrak Engineering Asset Management Improvement Program – ROADMAP





APPENDIX A: ASSET MANAGEMENT PLAN

Appendix B: Track Asset Strategy

Appendix B provides additional information on Amtrak's track assets and establishes the lifecycle management strategy to achieve a state of good repair (SOGR).

Overview

Pursuant to 49 U.S.C § 24320(a)(2), this appendix captures the unconstrained funding needs to adopt a normalized or steady state management strategy necessary to achieve a SOGR. It represents our latest thinking at the time of publication of what work needs to be accomplished based on the proposed use of the asset and its current condition.

The appendix is structured to be consistent with the main body of the IALP2019 with the following sections:

- [Asset Inventory](#) – provides further details on the track infrastructure assets across all parts of the national network.
- [Asset Condition](#) – presents our current understanding of track asset condition and our plans for improving our knowledge of the state of the asset.
- [Risk Management](#) – presents the asset and asset management risks and issues related to track infrastructure.
- [Asset Strategy](#) – presents the lifecycle strategies for the management of track infrastructure and our strategy for moving towards steady state replacement of the infrastructure.
- [Additional Funding Needs](#) – provides an assessment of the unconstrained steady state program and the forecast SOGR work bank necessary to bring the track infrastructure assets into SOGR.

Responsible Official

Pursuant to 49 U.S.C. § 24320(c)(3)(c) the following individual is responsible for Track infrastructure owned or managed by Amtrak:

- Steven Humes, Deputy Chief Engineer Track

Track Asset Inventory

Amtrak manages track assets (track, turnouts, ties, and fences) valued at over \$13.2 Billion. This includes 2,408 track miles of track infrastructure (including yards and sidings) nation-wide, of which 1,913 track miles are on the Northeast Corridor (main-line and branch lines) connecting Washington D.C., Philadelphia, New York and Boston.

Inventory Development

Amtrak Engineering acknowledges that the asset registry for Track assets is lacking some data attributes. The focus to date has been to ensure safety-critical assets are included. As part of an ongoing program of improvement the following issues will be addressed:

- [Age records](#) – were completed as part of I-AMP2017 (NEC and NEC Branch Lines) and IALP2019 (National Network). Gaps remaining will be resolved during further inventory updates in 2019 and 2020.
- [Asset attributes](#) – gaps exist in the asset attribute data, including rail type and tie type need completing for all track sections. This will be undertaken under the plan period.
- [Common Referencing](#) – asset records for track are currently maintained in several systems (separate systems for inventory information, track geometry, and curvature). While each system locates the asset or characteristic on the right-of-way, the method by which that is achieved is different in each instance (milepost and offsets, etc.). To enable analysis in the future a common referencing structure needs to be used. This is being considered as part of the Maximo 7.6 upgrade program.

NEC Main Line (Amtrak Owned)

Amtrak owns and operates 1,169 track miles of main-line on the NEC connecting Washington D.C., Philadelphia, New York and Boston. The corridor is largely built to operate as an FRA class 7 railroad with passenger speeds up to 125 mph.

In 2018 Massachusetts Bay Transportation Authority (MBTA) took over maintenance and responsibility for the 82 track miles of main line of the NEC it owns between Boston and Rhode Island state line, known locally as the Attleboro Line. These assets have been removed from this plan.

A summary of key Track infrastructure features on the NEC main line assets is shown below.

Table 15: NEC Main Line Track Assets

Asset Type	Count	Unit	Av Inst Date	Source Notes
Main-line Tracks				
Ballast	1,169	Track Miles	1987	Assumed same as rail
Rail	1,169	Track Miles	1987	2018 Inventory Information
Sidings and Yards				
Ballast	176	Track Miles	1980	Assumed same as rail
Rail	176	Track Miles	1980	2018 Inventory Information
Ties				
Concrete Ties	2,613,568	Each	1997	2018 Inventory Information ¹
Wood Ties	372,251	Each	2011	2018 Inventory Information ¹
Other Track Assets				
Turnouts	1,883	Each	1986	2018 Inventory Information
Fence	818,000	Lin. Ft.	N/A	2017 Amtrak AMP

1. For Ties we assume 3,520 ties/mile for wood ties and 2,640 ties/mile for concrete ties.

Note: Tie counts do not include block ties or direct fixation

NEC Branch Lines (Amtrak Owned)

In addition to the main line assets described above, Amtrak also owns branch lines which are considered part of the NEC in several contexts. The branch lines owned and operated by Amtrak consist of:

- The 262 track miles along the Keystone Corridor from Philadelphia, PA to Harrisburg, PA
- The 108 track miles Springfield Line from New Haven, CT to Springfield, MA
- The 19 track miles of the West Side Connection from New York Penn Station to Spuyten Duyvil, NY
- The 105 track miles of the Empire Line
- The 12 track miles of infrastructure on the Post Road Branch from Post Road Junction to Rensselaer, NY

The NEC branch lines are largely built to operate as a FRA class 6 railroad with passenger speeds up to 110 mph.

Table 16: NEC Branch Line Track Assets

Asset Type	Count	Unit	Av Inst Date	Source Notes
Main-line Tracks				
Ballast	505	Track Miles	1973	Assumed same as rail
Rail	505	Track Miles	1973	2018 Inventory Information
Sidings and Yards				
Ballast	63	Track Miles	1963	Assumed same as rail
Rail	63	Track Miles	1963	2018 Inventory Information
Ties				
Concrete Ties	329,201	Each	2004	2018 Inventory Information ¹
Wood Ties	856,624	Each	2011	2018 Inventory Information ¹
Other Track Assets				
Turnouts	551	Each	1986	2018 Inventory Information
Fence	142,000	Lin. Ft.	N/A	2017 Amtrak AMP

1. For Ties we assume 3,520 ties/mile for wood ties and 2,640 ties/mile for concrete ties.

Note: Tie counts do not include block ties or direct fixation

State of New York Supported Assets

Amtrak is also the responsible infrastructure manager for the long-term leased infrastructure⁶ on the 80.6 track miles Empire Corridor on the Hudson Line between Poughkeepsie, NY and Hoffmans (near Schenectady, NY), and owns outright two short segments of the Hudson Line in New York City and the Schenectady areas.

Table 17: State of New York - Track Assets

Asset Type	Count	Unit	Av Inst Date	Source Notes
Main-line Tracks				
Ballast	78	Track Miles	2014	Assumed same as rail
Rail	78	Track Miles	2014	2018 Inventory Information
Sidings and Yards				
Ballast	2.58	Track Miles	1991	Assumed same as rail
Rail	2.58	Track Miles	1991	2018 Inventory Information
Ties				
Concrete Ties	58,896	Each	N/A	2018 Inventory Information ¹
Wood Ties	204,341	Each	N/A	2018 Inventory Information ¹
Other Track Assets				
Turnouts	28	Each	1987	2018 Inventory Information
Fence	N/A	Lin. Ft.	N/A	2017 Amtrak AMP

1. For Ties we assume 3,520 ties/mile for wood ties and 2,640 ties/mile for concrete ties.

N/A – Not available – the data for these assets was not available for the 2019 Asset Line Plan

Note: Tie counts do not include block ties or direct fixation

⁶ Amtrak entered into a lease agreement with owners CSX in 2012.

National Network (Amtrak Owned)

Amtrak is also responsible for track infrastructure assets nationwide, including:

- Owning and operating 128 track miles of up to 110 mph track from Porter, Ind. to Kalamazoo, MI., along with 17.8 track miles of sidings.
- Owning and operating 55 track miles of yard tracks and sidings in Chicago, Los Angeles, New Orleans, New York City, Oakland (Kirkham Street Yard), Orlando, Portland, Saint Paul and Seattle.
- Maintaining and operating 7 track miles of yard tracks in Hialeah, near Miami, Florida, leased from the State of Florida.

Table 18: National Line Track Assets

Asset Type	Count	Unit	Av Inst Date	Source Notes
Main-line Tracks				
Ballast	128	Track Miles	1967	Assumed same as rail
Rail	128	Track Miles	1967	2018 Inventory Information
Sidings and Yards				
Ballast	62.4	Track Miles	1967	Assumed same as rail
Rail	62.4	Track Miles	1967	2018 Inventory Information
Ties				
Concrete Ties	2,112	Each	2016	2018 Inventory Information ¹
Wood Ties	399,555	Each	2015	2018 Inventory Information ¹
Other Track Assets				
Turnouts	556	Each	1987	2018 Inventory Information
Fence	40,000	Lin. Ft.	N/A	2017 Amtrak AMP

1. For Ties we assume 3,520 ties/mile for wood ties and 2,640 ties/mile for concrete ties.

Note: Tie counts do not include block ties or direct fixation

State of Michigan Supported Assets

Amtrak is also responsible for maintaining and operating the 182 track miles of infrastructure from Kalamazoo, MI to Dearborn, MI owned by the state of Michigan, along with 42.2 track miles of sidings. The Michigan line (Chicago-Detroit Line) has been upgraded to operate as a FRA class 6 railroad with speeds up to 110 mph.

Table 19: State of Michigan Track Assets

Asset Type	Count	Unit	Av Inst Date	Source Notes
Main-line Tracks				
Ballast	182	Track Miles	1967	Assumed same as rail
Rail	182	Track Miles	1967	2018 Inventory Information
Sidings and Yards				
Ballast	42.2	Track Miles	1967	Assumed same as rail
Rail	42.2	Track Miles	1967	2018 Inventory Information
Ties				
Concrete Ties	2,957	Each	2015	2018 Inventory Information ¹
Wood Ties	651,517	Each	2013	2018 Inventory Information ¹
Other Track Assets				
Turnouts	163	Each	1984	2018 Inventory Information
Fence	N/A	Lin. Ft.	N/A	2017 Amtrak AMP

1. For Ties we assume 3,520 ties/mile for wood ties and 2,640 ties/mile for concrete ties.

Note: Tie counts do not include block ties or direct fixation

Track Asset Condition

Amtrak's Track department conducts a program of condition monitoring activities to identify faults, prioritize intervention and ensure safe operation of the railroad. However, it has recognized a need to improve its condition assessment capability to predict the optimal point of replacement.

Overview

Amtrak Engineering currently conducts an extensive condition monitoring (inspection) program of track infrastructure assets at intervals in line with the designated track class of the infrastructure. On the national network, assets are monitored in accordance with FRA safety standards. For the NEC and NEC branch-lines, assets are monitored in accordance with the Amtrak MW 1000 standard⁷ which exceeds FRA standards. The following table summarizes the track monitoring program.

The current monitoring activities ensure safe operation of the railroad. They are used to identify faults and potential faults which result in prioritized and scheduled maintenance. There is little predictive analysis conducted to determine the rate of deterioration of assets and predict future track conditions.

Table 20: Summary of Track Condition Monitoring Activities

Activity	Scope/ Description
Visual Inspections – walking or hi-rail	Visual inspections to check general Track and roadbed conditions, check for safety limits, gage, alignment, surface, ties, rail etc. Some seasonal inspections.
Track Geometry Car	Assess the geometry profile of the Track system, including both vertical and horizontal alignments, super-elevation, rail profile, ride quality etc.
Sperry Rail Defect Car and Handheld Ultrasonic Inspection	Assess the rail for internal defects. Handheld ultrasonic test conducted following Sperry Car to confirm defect.
Ground Penetrating Radar	Assess the Track bed foundation and identifies defects.

Asset Condition Assessment Methodology

Pursuant to 49 U.S.C § 24904(c) Amtrak is required to undertake a "condition assessment of those inventoried assets for which a provider has direct responsibility and to level of detail to monitor and predict performance of assets and inform investment prioritization" (U.S. 49 CFR § 625.25(b)(2)).

In meeting this obligation, Amtrak has developed a track asset condition assessment guide⁸ and plans for its implementation are progressing. The guide assesses a series of condition factors, each graded between zero (asset is non-operable) through to five (asset is new or nearly new). The approach will result in a condition index for each asset and will enable assessment of SOGR.

For track assets, Amtrak consider an asset to be in SOGR when it meets maintenance limits described in MW1000, when it is in a condition where it can continue to meet and perform the functional requirements for which it was designed, and when the lifecycle investment needs of the asset have been met – including all

⁷ AMTRAK MW1000, "Limits and Specifications for Track Safety, Maintenance and Construction." - Rev 4 Date March 1st 2013.

⁸ Infrastructure Asset Condition Guidelines – Track. Version 5, Issued September 4th 2018.

scheduled maintenance. This definition is consistent with the definition laid out in U.S. 49 CFR § 625. Amtrak grade an asset in SOGR if it scores 2.5 on its updated condition assessment framework, described above.

For IALP2019 the age of the asset is being used to estimate the assets SOGR, based on the remaining useful life of the asset. This will be updated through 2019 and 2020 with visual and measured assessments.

IALP 2019 – Assessed Track Asset Condition

For IALP2019 the assessed asset condition of track, based on useful life of the asset is presented in Table 21 and Table 22.

Table 21: 2019 Assessed condition of track assets – owned by Amtrak

Asset Type	NEC Main Line		NEC Branch Line		National Network	
	Average SOGR	% Not in SOGR	Average SOGR	% Not in SOGR	Average SOGR	% Not in SOGR
Main-line Tracks						
Ballast	2.82	50.4%	1.81	63.5%	1.95	100%
Rail	2.82	50.4%	1.81	63.5%	1.95	100%
Sidings and Yards						
Ballast	2.22	68.2%	1.73	70.8%	1.87	100%
Rail	2.22	68.2%	1.73	70.8%	1.87	100%
Ties						
Concrete Ties	3.88	34.2%	3.79	4.8%	5.00	0.0%
Wood Ties	3.87	4.4%	4.39	2.5%	4.82	0.0%
Other Track Assets						
Turnouts	2.18	57.2%	2.56	54.8%	2.9	26.6%
Fence	-	55.3%				

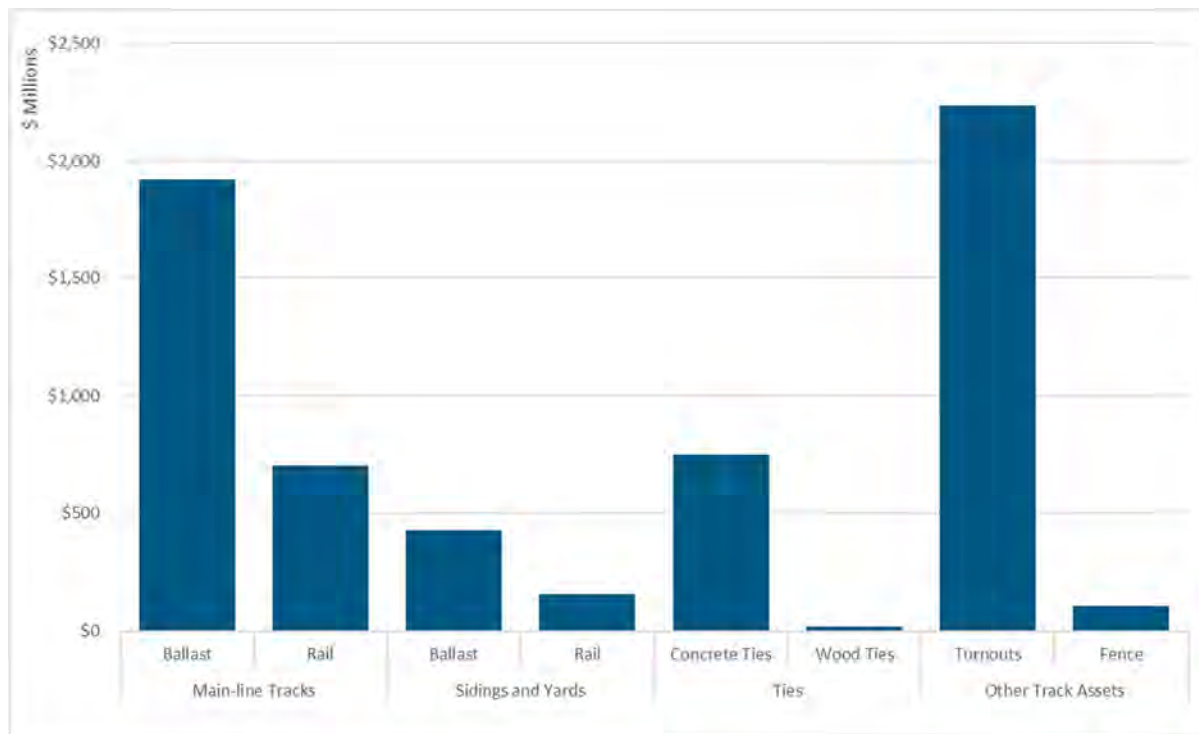
Table 22: 2019 Assessed condition of track assets – maintained and operated by Amtrak and owned by others

Ownership	Leased from CSX, Capital Funded by State of NY		Owned by State of Michigan	
Asset Type	Average SOGR	% Not in SOGR	Average SOGR	% Not in SOGR
Main-line Tracks				
Ballast	4.48	0.0%	1.00	100%
Rail	4.48	0.0%	1.00	100%
Sidings and Yards				
Ballast	3.15	0.0%	1.00	100%
Rail	3.15	0.0%	1.00	100%
Ties				
Concrete Ties	N/A	N/A	5.00	0.0%
Wood Ties	N/A	N/A	4.52	1.2%
Other Track Assets				
Turnouts	1.86	71.4%	1.85	81.0%
Fence				

Age records are not currently available for ties on the CSX leased infrastructure.

The replacement value of Track assets with a condition rating below 2.5, which are assessed as not being a state of good repair, is estimated to be [over \\$6.3 billion in 2018 dollars](#). This is Amtrak's SOGR Backlog for Track assets. The largest portion of this is the NEC main-line and branch-line assets owned by Amtrak, which is estimated to be over \$5 billion in 2018 dollars. An additional \$26.6 million backlog is present on the CSX leased lines which are capital funded by the State of New York. The national network accounts for \$606.7 million in backlog, with an additional \$662 million backlog on the Michigan owned infrastructure. Figure 24 presents the backlog by Track asset type. Turnouts represent the largest portion of the backlog at \$2.23 billion – with backlog on the NEC Main Line and Branch line alone representing \$1.4 billion. followed closely by ballast undercutting along main-line nationally at \$1.9 billion.

Figure 24: TRACK Estimated SOGR Backlog by Asset Type (\$m 2018)



Risk Management

Risk management continues to be introduced through IALP2019 to support decision making, planning and prioritization.

Overview

The FAST Act requires that both asset and asset management risks are captured to inform investment prioritization and establish implementation strategies.

Currently, risk management occurs across the Engineering Department and is highly focused on maintaining a safe railroad operation. For track infrastructure assets, this is achieved through a comprehensive inspection-and-condition monitoring program as defined in the MW1000 standard. This approach ensures that the railroad is maintained to meet minimum safety standards.

Amtrak acknowledges the lack of established risk analysis, evaluation and management processes for managing longer-term and non-safety risks. As part of I-AMP2017, Amtrak conducted a basic risk identification exercise for track assets and asset management practices. This has been revisited as part of IALP2019.

Amtrak intends to continue to develop its risk management processes – by establishing a ‘known concerns’ log and by updating and monitoring the risks identified in this asset strategy as part of the annual asset line plan development.

Track Risk Register

The risk register provided in Table 23 has been captured through consultation with Amtrak Track engineering staff. Risks have been identified and where possible management actions established. The top three risks are as follows:

1. Adequate qualified resources
2. Access to reliable equipment
3. Track access

Risks are grouped in the categories identified in appendix A. The service objective(s) – from the Asset and Asset Management Performance section – impacted by the risk are also noted.

Table 23: Track – Asset and Asset Management Risk Register

Ref:	Route Impact	Risk description	Risk impacts (service objectives)	Existing/ planned control
Organization risks				
TK001	NEC	Insufficient engineering resources available, results in reduction in ability to address preventive maintenance needs and impacts Amtrak's ability to provide a reliable track infrastructure.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	<ul style="list-style-type: none"> → Planned: Review resource needs as part of wider Engineering Department resource study → Planned: Develop a robust resource plan, identify gaps and establish a strategy for attracting and retaining staff in key roles → Planned: Explore ability to supplement Amtrak forces with contractors
TK002	All	Staff attrition (including imminent retirement) results in reduction of qualified and experienced track resources and impacts Amtrak's ability to deliver work and support other departments.	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	<ul style="list-style-type: none"> → Planned: Review resource needs as part of wider Engineering Department resource study → Planned: Plan for impact of voluntary separation on Track resource levels
TK003	All	Shortage of qualified equipment operators, results in reduction in capacity to undertake key maintenance activities and impacts Amtrak's ability to provide a reliable track infrastructure.	1. Provide safe and reliable infrastructure for train services	<ul style="list-style-type: none"> → Planned: Re-examine training programs and required qualifications for equipment → Planned: Procure newer equipment that is easier to operate (newer equipment is also generally more efficient and reliable)
TK004	All	Insufficient track resource available to deliver work beyond the previously committed capital projects, results in reduction in our ability to address priority maintenance and impacts Amtrak's ability to provide a reliable track infrastructure.	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	<ul style="list-style-type: none"> → Planned: Review resourcing and consider dedicated resource for capital projects to increase resources available for routine maintenance → Planned: Review coordination of work funded by outside agencies – establish plan to improve cross-

				discipline planning in Engineering and coordinate with outside funding partners
TK005	NEC	Insufficient C&S and ET resources to support track work (shortage of third rail and other ET staff in New York is particularly acute), results in planned work not being completed, increased risk to C&S and ET assets and impacts Amtrak's ability to deliver planned maintenance efficiently.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Establish plan to improve cross-discipline planning in Engineering
TK006	All	Labor agreements allow senior staff to 'bid-out', which results in a lack of qualified staff filling roles and impacts Amtrak's ability to deliver maintenance efficiently.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Reexamine labor agreements to improve ability to retain qualified staff and decrease qualified staff bidding out for other jobs
TK018	All	Training capacity limitations (for foreman) results in reduced qualified staff availability and impacts Amtrak's ability to deliver maintenance efficiently.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Reexamine training capability requirements to meet capacity limitations
Asset management Risks				
TK007	NEC	No central coordination of work results in planned work not being completed and impacts our ability to deliver maintenance efficiently.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Establish plan to improve cross-discipline planning in Engineering. Engage with transportation to more efficiently utilize track access. Engage with Mechanical to ensure motive power is made available.
TK008	All	Poor quality and missing track information (including data attributes, data structures and information about	1. Provide safe and reliable infrastructure for train services	→ Current: Track capital program informed by local knowledge that drives prioritization for replacement

		certain assets – including drainage) results in ineffective decision making and impacts Amtrak’s ability to prepare long-term plans.	2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery	→ Planned: Asset registry improvement activities as identified in this plan
TK009	NEC	Poor quality information about site characteristics and asset configuration, results in inefficient use of track time and impacts Amtrak’s ability to deliver maintenance efficiently.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery	→ Current: Project Initiation Document and Site Specific Work Plan for each site is produced → Planned: Develop a plan to capture institutional knowledge of physical characteristics and configurations to maximize outage time
TK010	NEC	Limited Track Outage Time – inhibits duration of track outages and work that can be completed; capital projects and other needs typically get higher priority and some require multiple disciplines to be present.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Review opportunity to cancel last 10PM train to allow more track access → Planned: Review need for long-term (50+) outages for major projects such as tackling mud spots and other level 1 defects with a complete dig out and replacement of ballast rather than tamping → Planned: Seek agreement/clarity/ transparency regarding track outage scheduling constraints
TK011	NEC	Poor advanced planning of track outage results in inefficient use of track time and impacts Amtrak’s ability to deliver maintenance efficiently.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Improve advanced planning of track outages along with coordination across Engineering disciplines → Planned: Establish a mechanism to improve coordination with Transportation to better understand constraints on outages → Planned: Consider increasing overnight outage durations → Planned: Stage/store equipment closer to work locations

TK012	All	Aging and functionally obsolete support equipment results in inefficient use of track time, inefficient delivery of maintenance and impacts Amtrak's ability to maintain a reliable track infrastructure. (Note: Tampers -1990's; undercutting machine -1990's; TLM -late 1970's. TLM was designed to replace wood ties with concrete, and is now replacing concrete with concrete).	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Current: Specialty track equipment requires long lead times (typically two years) and planning to purchase – in the process of acquiring new equipment, including replacing cranes → Planned: Review and build justification for the purchase of new equipment recognizing the long lead times for track plant
TK013	All	Limited yard space for track maintenance equipment (for example at Adams and Hunter Yard) results in issues with getting equipment out to site and impacts our ability to maintain the infrastructure efficiently.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ No actions planned
TK014	All	Unavailability of dedicated rail grinding equipment results in deteriorating rail and poor rail profile, and impacts Amtrak's ability to maintain ride quality and adhere to FRA guidelines for high speed rail.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Establish plan for rail grinding, and review opportunity to coordinate with other rail industry partners (LIRR & MNR) to obtain equipment (or access to equipment)
TK015	All	Procurement rules and processes results in long lead time to acquire track components and impacts Amtrak's ability to maintain track infrastructure efficiently.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Review opportunity to streamline procurement processes and to accelerate requisitions → Planned: Review justification for increasing number of Track buyers in procurement
TK019	NEC	Emergency replacement of Ties, where undercutting is not carried out, results in reduced lifecycle and impacts the lifecycle costs of the asset	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ No actions planned

Asset risks

TK016	All	Localized poor track bed conditions, instability in underlying soils (for example Maryland and Rock Cuts in New England) results in repeated occurrence of mudspots and impacts Amtrak's ability to maintain reliable track infrastructure.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Plan to obtain a small undercutter to replace existing equipment that is functionally obsolete → Planned: Pilot different design solutions to address soil stability (e.g., stiffening with asphalt)
TK017	NEC	Aging and unmaintained track assets in the Empire Tunnel to Spuyten Duyvil results in increased hazards due to severe curvature and impacts Amtrak's ability to maintain reliable track infrastructure.	1. Provide safe and reliable infrastructure for train services	→ RESOLVED
TK020	NEC	Manufacturing defects results in unreliable Rocla ties, which impacts track performance and reliability.	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	→ Current: To maintain operational performance, all Rocla concrete ties plan to be replaced by 2022
TK021	NEC	End of life of San-Vel concrete ties results in increased risk of concrete tie failure, which impacts Amtrak's ability to provide safe and reliable track infrastructure.	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	→ Current: Ongoing replacement program
TK022	National Network	Rocla tie program results in delayed wood tie replacement program, which impacts Amtrak's ability to provide reliable infrastructure and impacts performance.	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	→ No actions planned

Track Asset Strategy

Lifecycle management strategies updated as part of IALP2019 capture the normalized or steady state activities necessary to maintain a steady state of good repair and ensure track assets are functional and able to continue to support a safe, efficient and sustainable national rail network.

Overview

The current track lifecycle management strategies are focused on maintaining the minimum safety standards and removing known concerns through programed capital replacement. For the national assets, the track lifecycle strategies are consistent with the FRA safety standards. For the NEC, the strategy is laid out in the MW 1000 standard which provides more stringent lifecycle management approaches over the FRA standards.

Current strategies are developed through engineering judgement and knowledge of the asset from maintenance inspection reports. Capital investment decisions are prioritized using a committee approach, reviewing risks and other information to determine the capital plan.

In I-AMP2017, Amtrak commenced a review of the lifecycle strategies for all infrastructure assets. Its purpose, was to develop the long-term normalized or steady state infrastructure maintenance and improvement program. Amtrak recognized that to achieve this requires addressing a sizeable backlog in infrastructure investment before a program of steady state or normalized maintenance can be adopted.

The lifecycle management strategies for Track infrastructure laid out in the following sections define the approach adopted for the 2019 program and the revised approach for the years following to address backlog and approach steady state for state of good repair.

Current Asset Strategies

The lifecycle management strategies employed by Amtrak to achieve its track asset objectives are described in Table 24. These strategies have been applied to determine the 2019 work bank.

The aim of the Track department is to maintain and improve the condition of the track infrastructure to minimize the risk to safety and train service impact. Work is categorized into the following:

- Inspection/ monitoring activities to confirm the asset can function in its required state and provide a safe operational environment.
- Preventive maintenance activities to achieve a required level of asset performance and maintain a safe operational environment.
- Corrective maintenance activities to return the asset to its required function and restore a safe operational environment.
- Capital maintenance to restore the asset to an operational design standard and maintain performance.
- Capital replacement to renew the asset and maintain performance.
- Capital improvement to replace the asset and improve performance or network capability.

Table 24: Current Lifecycle Management Strategies - Track

Category	Description
Inspection/ Monitoring	<p>Inspections and monitoring activities to identify defects before failure. These include:</p> <ul style="list-style-type: none"> → Track Geometry Car, → Sperry Ultrasonic Rail Inspection Car (internal rail defect identification), → Gage Restraint Measurement, → Monitoring Systems on Acela (ARMS), → Track walk/high rail visual inspections, and → GPR inspection of Track bed (sub-grade) conducted every 5 years. <p>Other remote condition monitoring systems used to detect detrimental wheel/rail interface issues include:</p> <ul style="list-style-type: none"> → Wheel Impact Load Detectors (WILDs), → Lateral Load Devices (used to manage detrimental bi-level train wheel/rail interaction at New England locations), and → Rail temperature monitoring to intervene with operating restrictions to protect track against buckling/pull-apart.
Preventive Maintenance	<p>Preventive maintenance activities to achieve the asset useful life benchmark in its current operational environment (load, speed etc.) – this includes rail lubrication, spot repairs to the fastening system (ties, clips, etc.).</p> <p>Preventive maintenance to prepare for seasonal changes to maintain minimum operation standards is defined in MW 1000.</p>
Corrective Maintenance	<p>Unplanned maintenance following identification of all defects and failures to return track to minimum operation standards per FRA standards for national assets and MW1000 standard for NEC assets.</p> <p>Planned corrective maintenance to remove other defects, based on risk and install permanent solutions where appropriate.</p>
Capital Maintenance	<p>Capital maintenance to restore track structure to operational design standard – as defined in both the FRA standard and MW 1000 standard. This includes:</p> <ul style="list-style-type: none"> → Surfacing and lining operations to restore track geometry design, → Undercutting to improve ballast quality and restore track geometry design, and → Limited rail grinding to restore the railhead profile, remove rail corrugation and reduce rail deterioration.
Capital Replacement	<p>Replacement in whole or part of the track structure, to restore design capability of the asset when it no longer becomes cost effective to maintain or presents an unacceptable safety or operational risk. Factors considered: defect rate, wear and age.</p> <p>Note there is limited ballast replacement currently carried out. The current strategy is to undertake a heavier undercutting (add more new ballast) as required.</p>
Capital Improvement	<p>Replacement in whole or part of the track structure, to improve the capability of the track infrastructure. Improvement includes increases to track class resulting in ability to operate at higher speeds and improvements to track layout to improve network capacity.</p>

Moving Towards Normalized or Steady State Maintenance

Overall Approach

As reported in I-AMP2017, there are four key elements to the track lifecycle management strategy, namely:

Achieve SOGR	The primary objective of this strategy is to bring the track assets to a state of good repair and then maintain them in a steady state to ensure sufficient capability to meet operational needs.
Prevent Insidious Decline	While Amtrak progresses towards SOGR, the inspection and monitoring regime documented in FRA Standards (for national assets) and MW 1000 standard (for NEC assets) will guard against the insidious decline in the condition of any individual sections of track and ensure that the asset remains in a safe operational state.
Maintain Performance	The implementation of the strategy is through a program that is prioritized to ensure that the Track infrastructure is able to function in its required state, thus minimizing performance loss due to asset faults and failures, temporary speed restrictions or extended Engineering access.
Support Network Capability Improvement	The program is also designed to ensure that track assets contribute to capability targets established through the Amtrak Service Plans and exploit opportunities for improved alignment and track configuration to enable higher speeds and improved network capacity.

Transition Strategy

The approach taken has been to establish useful life benchmarks (ULBs) to define a program of steady state or normalized maintenance necessary to maintain SOGR. Useful life benchmarks have been established through several sources, including:

- Previous SOGR reports and studies conducted in the last 5 to 10 years
- Engineering review and judgement of typical lifecycle of assets on Amtrak property
- Independent review by outside parties
- International benchmarking against comparable rail networks including those in the United Kingdom and Europe

The concept of a useful life benchmark supports the development of a required work bank, but is not an asset management strategy. This is because the transition to steady state maintenance requires backlog needs to be addressed first. Further, as we move to a steady state replacement cycle, the first iteration needs to be staged (prioritized) such that the ongoing work program is manageable year over year. Table 23 summarizes the proposed replacement cycles and implementation strategies. As highlighted in the main-body of this document, the transition strategy also needs to consider:

- [Track access](#) – current outage availability restricts efficient project delivery. This will need to be reviewed to economically address the backlog.
- [Labor resources](#) – currently production workforces are only available for track capital work. The New Jersey High Speed project demonstrated the value in re-thinking how we tackle projects – and considering production workforces for other asset classes.
- [Equipment](#) – current equipment capacity is insufficient. This is addressed in [Appendix F](#).
- [Funding](#) – the backlog identified is significant – a robust and consistent funding stream needs to be established.

Table 25: IALP2019 Track Lifecycle Management Strategy

Activity	Lifecycle strategy / benefit	Implementation strategy
Inspection/ Monitoring		
General	→ To prevent insidious decline of track assets, continue to perform activities based on FRA and MW 1000 standard.	→ No significant change to current practice.
Preventive Maintenance		
General	→ To prevent insidious decline of track assets, continue to perform activities based on FRA and MW 1000 standard.	→ No significant change to current practice.
Corrective Maintenance		
General	→ To prevent insidious decline and maintain operational performance of track assets, continue to perform activities based on FRA and MW 1000 standard.	→ No significant change to current practice.
Capital Maintenance		
Surfacing	Track class 1-5: → No cyclical program of surfacing. Track class 6-8: → To maintain operational performance and support network capability, undertake track surfacing on a 3-year cycle as a preventive maintenance activity.	→ Cyclical track surfacing is driven by analysis of data collected from track geometry recording car. A program of increased reference surfacing will be developed through this AMP period (2020-2024). Increased work volume will require procurement of additional high-speed surfacing equipment.
Undercutting	→ To achieve SOGR and maintain operational performance and prevent insidious decline, rehabilitate ballast through undercutting performed every 18 years.	→ A program of increased undercutting will be developed through this AMP period (2020-2024). Increased work volume will require procurement of additional undercutting equipment.

Rail Grinding	<p>Track Class 6-8:</p> <ul style="list-style-type: none"> → To maintain operational performance and prevent insidious decline, undertake a program of rail grinding on a 3-year cycle. 	<ul style="list-style-type: none"> → A program of increased rail grinding will be developed through this AMP period (2020-2024). Increased work volume will require procurement of additional grinding equipment.
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Capital Replacement

The NEC mainline is the busiest railroad in North America. In 2021, Acela services will run at ½ hr. scheduled frequencies which will result in a decreased opportunity to do any track work on the main line. Track access is therefore a significant constraint to implementing the lifecycle management strategies below. With that in mind, an amended work package strategy is proposed that makes more efficient use of track access. This includes the following strategies:

- The replacement of the entire track system if more than two primary assets (rail, ties or ballast) are within 6 years of their useful life benchmark.
- Extension of the length of planned track system renewal should other sections within the vicinity be within 6 years of their useful life benchmark.
- Replacement of all remaining Rocla concrete ties by 2022. (Rocla ties are a primary cause of performance related reliability issues).

This approach is being introduced to maximize the use of track outages. The approach will be further developed through this AMP period (2020-2024) to ensure that the necessary track outages and track equipment are available to support this work package strategy.

Concrete Ties	<p>Track class 1-4:</p> <ul style="list-style-type: none"> → To achieve SOGR and maintain operational performance, concrete ties plan to be replaced every 60 years on all off-corridor running rail in track class 1-4, depending on traffic usage and track class. <p>Track class 5-8:</p> <ul style="list-style-type: none"> → To achieve SOGR and maintain operational performance, concrete ties will be replaced every 40 years on all tangent running rail in track class 5-8. → To achieve SOGR and maintain operational performance, concrete ties will be replaced every 40 years on all curved running rail in track class 5-8. 	<p>Track class 1-4:</p> <ul style="list-style-type: none"> → A program of concrete tie replacement is introduced through this AMP period (2020-2024). To manage the backlog of renewals and provide a levelled work program, delivery of the work bank is spread over a 10-year period. <p>Track class 5-8:</p> <ul style="list-style-type: none"> → A program of concrete tie replacement is introduced through this AMP period (2020-2024). To manage the backlog of renewals and provide a levelled work program, delivery of the work bank is spread over a 10-year period. → For efficient use of track access, replacement of concrete ties will coincide with rail renewal if rails are life expired within 6 years of planned work.
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	<ul style="list-style-type: none"> → To maintain operational performance, all defective Rocla concrete ties plan to be replaced by 2022. 	
Wood Ties	<p>Track class 1-4:</p> <ul style="list-style-type: none"> → To achieve SOGR and maintain operational performance, wood ties will be replaced every 35 years on all off-corridor running rail in track class 1-4, depending on traffic usage and track class. <p>Track class 5,6:</p> <ul style="list-style-type: none"> → Our general strategy is to replace wood ties with concrete ties where economical to do so on higher class lines. → To achieve SOGR and maintain operational performance, wood ties will be replaced every 25 years on all corridor running rail in track class 5-6, depending on traffic usage and track class. → To improve network performance, it is our desire to replace wood ties with concrete ties on corridor at the earliest cost-effective opportunity. <p>Track class 7,8:</p> <ul style="list-style-type: none"> → No wood ties remaining. 	<p>Track class 1-4:</p> <ul style="list-style-type: none"> → A program of wood tie replacement is introduced through this AMP period (2020-2024). To manage the backlog of renewals and provide a levelled work program, delivery of the work bank is spread over a 10-year period. → Note: Typical production delivery, replaces every 3rd tie only. As a result, each location should be visited 4 times in a 35-year period (roughly every 8 years) <p>Track class 5-8:</p> <ul style="list-style-type: none"> → A program of wood tie replacement is introduced through this AMP period (2020-2024). To manage the backlog of renewals and provide a levelled work program, delivery of the work bank is spread over a 10-year period. → For efficient use of track access, replacement of wood ties with concrete will coincide with either ballast renewal or rail renewal if either are life expired within 6 years of planned work. → Note: Typical production delivery, replaces every 3rd tie only. As a result, each location should be visited 3 times in a 25-year period (roughly every 8 years).
Fastening System	<ul style="list-style-type: none"> → To achieve SOGR and maintain operational performance, the fastening system will be replaced at the same frequency as undercutting operations. 	<ul style="list-style-type: none"> → Fastening system replacement occurs simultaneously with undercutting operations.
Rail	<p>Track class 1-4:</p> <ul style="list-style-type: none"> → To achieve SOGR and maintain operational performance, rail will be replaced every 60 years on all off-corridor running rail in track class 1-4, depending on traffic usage and track class. 	<p>Track class 1-4:</p> <ul style="list-style-type: none"> → A program of rail replacement is introduced through this AMP period (2020-2024). To manage the backlog of renewals and provide a levelled work program, delivery of the work bank is spread over a 10-year period. <p>Track class 5-8:</p>

	<ul style="list-style-type: none"> → To achieve SOGR and maintain operational performance, rail will be replaced every 55 years on all curved running rail in track class 1-4. <p>Track class 5-8:</p> <ul style="list-style-type: none"> → To achieve SOGR and maintain operational performance, rail will be replaced every 50 years on all tangent running rail in track class 5-8. → To achieve SOGR and maintain operational performance, rail will be replaced every 40 years on all curved running rail in track class 5-8. <p>Obsolete Sections:</p> <ul style="list-style-type: none"> → All 119lb., 152lb. and 155lb. rail sections will be replaced at the earliest opportunity – as these sections are no longer manufactured. <p>Cascading:</p> <ul style="list-style-type: none"> → With the arrival of the new rail delivery train, a program of cascading rail from high track classes to low classes/yards/sidings will be developed. 	<ul style="list-style-type: none"> → A program of rail replacement is introduced through this AMP period (2020-2024). To manage the backlog of renewals and provide a levelled work program, delivery of the work bank is spread over a 5-year period. → For efficient use of track access, replacement of rail will coincide with tie renewal if ties are life expired within 6 years of planned work or if they are wood.
Turnouts	<p>Track class 1-4:</p> <ul style="list-style-type: none"> → To maintain operational performance, rehabilitate all turnout components every 20 years at roughly 30% of the cost of replacement. → To achieve SOGR and maintain operational performance, replace turnouts every 40 years at roughly 30% of the cost of replacement. <p>Track class 5-8:</p> <ul style="list-style-type: none"> → To maintain operational performance, rehabilitate all turnout components every 15 years at roughly 30% of the cost of replacement. 	<p>Track class 1-4:</p> <ul style="list-style-type: none"> → A program of turnout rehabilitation and replacement is introduced through this AMP period (2020-2024). For efficient use of track access, replacement of turnouts will coincide with ballast renewal. <p>Track class 5-8:</p> <ul style="list-style-type: none"> → A program of turn rehabilitation and replacement is introduced through this AMP period (2020-2024). For efficient use of track access, replacement of turnouts will coincide with ballast renewal.

	<ul style="list-style-type: none"> → To achieve SOGR and maintain operational performance, replace turnouts every 30 years at roughly 30% of the cost of replacement. → To maintain operational performance, wood tie turnouts will only be replaced with concrete turnouts when the surrounding wood tie tracks are replaced with concrete. 	
Fence	To maintain SOGR, replace fences every 50 years.	A program of fence replacement will be developed through this AMP period (2020-2024).
Capital Improvement		
East of Mystic Interlocking Improvement	→ To improve network performance and enable more maintenance opportunity in the future a new interlocking is being constructed East of Mystic.	→ Within current capital plan.
Harrisburg Interlocking Improvement	→ To improve network performance and to increase speed, replacement of the Harrisburg interlocking with modern equivalent.	→ Within current capital plan.
National Network Improvements	→ Current renewal programs are focused on rail only. To enable future service improvements, a program of tie replacement (upgrading to concrete) and track layout improvements – including adding sidings as needed – should be delivered before new services are added.	→ Through this AMP period (2018-2022), the asset management plan will be further developed for national network assets to ensure the infrastructure is in place prior to any planned service improvements.

Additional Funding Needs

The estimated unconstrained steady state program has been derived from our lifecycle management strategies. The SOGR backlog has been determined based on asset conditions and establishes the transition to a steady state program. A comparison against the FY2019-FY2024 capital program shows a shortfall of \$3.93 billion over the six-year period.

Overview

Pursuant to 49 U.S.C § 24320(a)(2), the funding needs for track assets in excess of amounts authorized or otherwise available to Amtrak is described in this section. The following is covered:

- Amtrak's FY2019 to FY2024 capital program provides the next six years fiscally constrained or budgeted work bank (this is included in full in the main-body of the document).
- An SOGR program, based on the assessed condition of the assets, as noted in the Track Asset Condition section above. For IALP2019 we used age as a proxy for condition. The purpose of this is to identify specific asset priorities and to begin developing a work plan for transitioning to a steady state program.
- A steady state program, based on the useful life benchmarks identified in the Track Asset Strategy section above. The purpose of this program is to establish the level of normalized renewals necessary to maintain the infrastructure in a SOGR. This assessment neither considers the current condition of the asset nor addresses the backlog but does provide an indicator of whether annual funding levels are adequate.

FY2019 to FY2024 Track Capital Program

Table 26 provides a summary of the FY2019 to FY2024 capital investment plan for track assets by route/ownership. Further information is included in the [Work Plan and Budget Forecast section](#) of the main-body of this document.

Table 26: Total Asset Class Funding - FY2019 to FY2024 Track Capital Program - Summary by Route/Ownership (in \$)

Route	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Amtrak Owned (including Engineering Significant Projects)						
NEC Main Line	348,477,102	370,121,250	368,475,387	403,489,027	436,067,435	366,305,616
NEC Branch Line	29,080,000	18,684,900	17,050,447	17,426,961	17,814,770	18,214,211
National Network	38,220,000	42,812,000	38,282,361	44,836,286	46,106,375	47,414,564
Maintained and Operated by Amtrak, Owned by Others						
Owned by CSX and funded by State of NY	4,600,000	4,600,000	1,250,000	1,257,500	1,265,225	1,273,182
Owned by the State of Michigan	7,651,147	8,064,681	8,306,622	757,981	780,720	804,142
Track Capital Program – sub-total	428,028,249	444,282,831	433,364,817	467,767,755	502,034,525	434,011,715
TOTAL	2,709,489,892					

Forecast Funding Need to Address SOGR Backlog

Based on the 2018 assessed condition of the Track asset inventory (see Track Asset Condition above), the SOGR Backlog for track assets is estimated to be **over \$6.3 billion in 2018 dollars**. Amtrak acknowledge that the condition of an asset is determined by more than just its age. In 2019 through 2020, we will be implementing a program of condition assessments to further inform our planning and prioritization capability, with future SOGR programs being derived from an improved understanding of asset condition and the deterioration of condition through asset operations.

Given the advancing age of the track infrastructure and historical underinvestment, Amtrak Engineering determined the need for a **10-year SOGR backlog reduction program**. Without a commitment to address the \$6.3 billion backlog we will face serious operational constraints in the years ahead as the track infrastructure will reach the end of its useful life, potentially resulting in degradation of service reliability and significant reduction of capacity. The required investment need over the planning period to address SOGR is set out in Table 27. This highlights a \$3.34 billion shortfall against forecast expenditure allocated to address SOGR backlog, non-re-occurring projects and significant projects. We will continue to develop our approaches to identifying backlog and our strategies for addressing SOGR in forthcoming plans.

Table 27: Estimated SOGR Backlog Reduction (10-year Program) - Summary by Route

Route	Total SOGR Backlog	Estimated Annual Cost	2019-2024 Total Investment Need
Amtrak Owned			
NEC Main Line	\$ 3,798,241,485	\$ 379,824,148/yr	\$ 2,278,944,891
NEC Branch Line (Amtrak owned)	\$ 1,225,409,017	\$ 122,540,902/yr	\$ 735,245,410
National Network (Amtrak owned)	\$ 606,706,359	\$60,670,636 /yr	\$ 364,023,815
Maintained and Operated by Amtrak, Owned by Others			
NEC Branch Line (Owned by CSX and funded by State of NY)	\$ 26,600,000	\$ 2,660,000 /yr	\$ 15,960,000
National Network (Owned by the State of Michigan)	\$ 662,076,323	\$ 66,207,632 /yr	\$ 397,245,792
Amtrak Track SOGR Backlog 10-Year Program	\$ 6,319,033,183	\$ 631,903,318 Per annum	\$ 3,791,419,910 Per Plan Period

Forecast Steady State Funding Need

Table 28 below outlines the estimated normalized or steady state program based on the track asset strategy and provides an indicator of whether current funding levels are adequate. It should be noted that this represents an unconstrained work bank and establishes the level of normalized renewals necessary to maintain the infrastructure in a state of good repair. It therefore assumes that SOGR backlog is being addressed outside of the funding identified below. For comparison purposes, we have shown the Steady State Investment against the TOTAL FY2019 to FY2024 capital investment plan. However, there is a \$0.59 billion shortfall against forecast expenditure allocated to steady state over the plan period.

Table 28: Estimated Steady State Program and Comparison to Current Plan - Summary by Route/Ownership

Route	Normalized or Steady State Annual Investment Need	Total Req'd Steady State Investment over plan 2019 -2024	TOTAL 2019-2024 Capital Investment Estimate
Amtrak Owned			
NEC Main Line	\$ 273,559,421	\$ 1,641,356,528	\$ 2,292,935,817
NEC Branch Line	\$ 99,855,868	\$ 599,135,208	\$ 118,271,289
National Network	\$ 49,373,296	\$ 364,023,815	\$ 257,671,586
Maintained and Operated by Amtrak, Owned by Others			
NEC Branch Line (Owned by CSX and funded by State of New York)	\$13,275,833	\$ 79,654,996	\$ 14,245,907
National Network (Owned by the State of Michigan)	\$39,006,815	\$ 234,040,892	\$ 26,365,293
Amtrak Track Steady State Program	\$ 473,622,393	\$ 2,918,211,439	\$ 2,709,489,892 Total of which \$2,583,314,892 for SS

Further detail on the estimated required steady state production units compared to the average annual production rate is provided in Table 29.

Table 29: Comparison of Estimated Steady State to FY 2019

Activity	Asset Count	Useful Life	Steady State	FY 2019	FY 2020	FY 2021	FY 2022**	FY 2023**	FY 2024**
Concrete Ties (TLS)	3,006,734	45 yrs.	65,467 Each	84,248	100,000	100,000	0	100,000	100,000
Wood Ties	2,484,288	30 yrs.	82,040 Each	38,000	65,000	165,000*	165,000*	165,000*	65,000
Rail	2,408	50 yrs.	48 Trk Mi.	47	45	45	83	83	45
Turnouts	3,181	30 yrs.	106 Each	59	50	50	50	50	50
Undercutting	2,408	18 yrs.	134 Trk Mi.	61	80	80	100	100	100

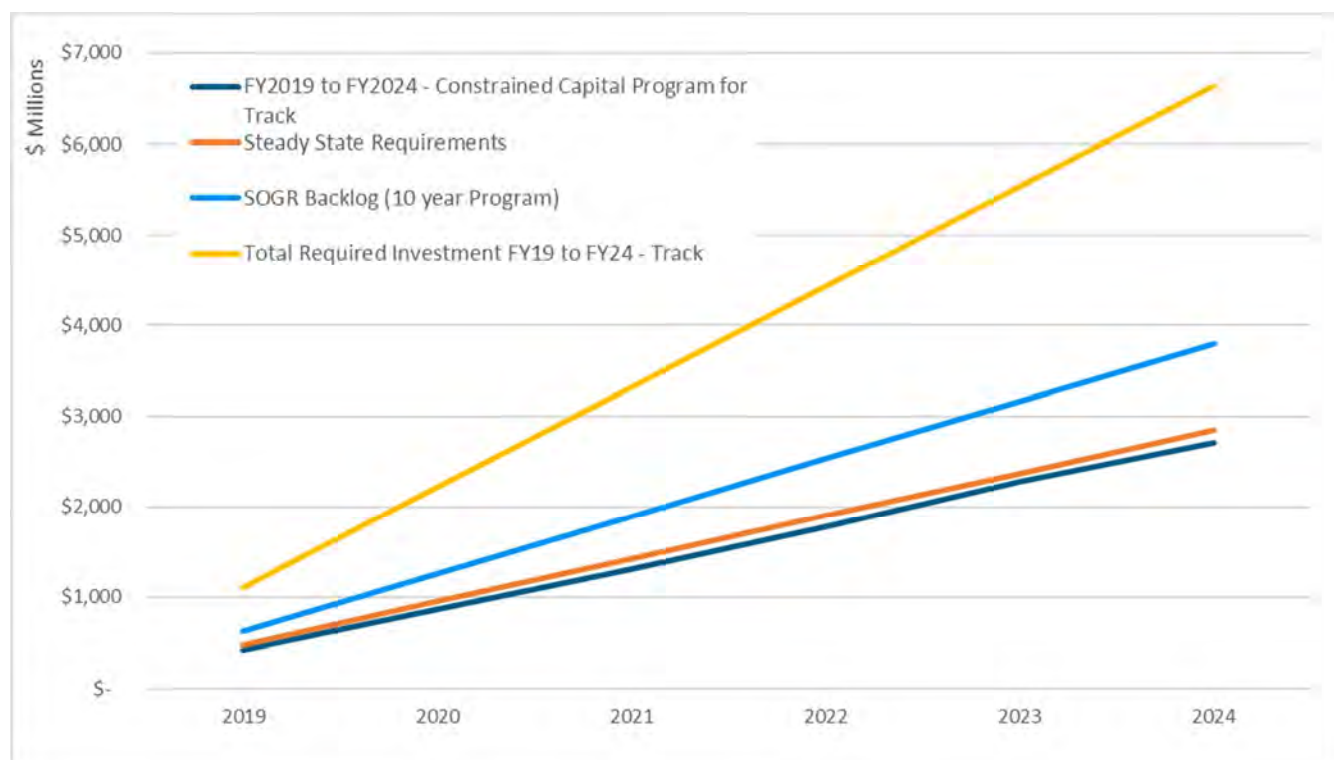
* Existing TLM replacing wood with concrete. Retire existing TLM close of FY23.

** Assumes delivery of new equipment in time for FY22.

Comparison of Capital Plan, with SOGR Backlog and Estimated Steady State Need

Figure 25 presents a comparison of the budgeted capital program against normalized steady state level of investment and the level of investment needed to begin addressing the SOGR backlog. This analysis highlights a total **\$3.93 billion** shortfall across the planning period for track infrastructure.

Figure 25: Track - Comparison of FY2019-2024 Constrained Capital Plan, with Estimated Steady State Replacement and Forecast SOGR Program



Appendix C: Bridges and Buildings Asset Strategy

Appendix C provides additional information on Amtrak's Bridges and Buildings (B&B) assets and establishes the lifecycle management strategy to achieve a state of good repair (SOGR).

Overview

Pursuant to 49 U.S.C § 24320(a)(2) this appendix captures the unconstrained funding needs to adopt a normalized or steady state management strategy necessary to achieve a SOGR. It represents our latest thinking at the time of publication of what work needs to be accomplished based on the proposed use of the asset and its current condition.

The appendix is structured to be consistent with the main body of the IALP2019 with the following sections:

- [Asset Registry](#) – provides further details on the B&B infrastructure assets across all parts of the national network.
- [Asset Condition](#) – presents our current understanding of B&B asset condition and our plans for improving our knowledge of the state of the asset.
- [Risk Management](#) – presents the asset and asset management risks and issues related to B&B infrastructure.
- [Asset Strategy](#) – presents the lifecycle strategies for the management of B&B infrastructure and out strategy for moving towards steady state replacement of the infrastructure.
- [Additional Funding Needs](#) – provides an assessment of the unconstrained steady state program and the forecast SOGR work bank necessary to bring the B&B infrastructure assets into SOGR.

Responsible Official

Pursuant to 49 U.S.C. § 24320(c)(3)(c) the following individual is responsible for B&B infrastructure owned or managed by Amtrak:

- Paul DelSignore, Deputy Chief Engineer Structures

B&B Asset Inventory

Amtrak manages B&B assets valued at over \$48 Billion – including 1,297 undergrade bridges, 14 movable bridges and 103,214 linear feet of tunnel systems nation-wide.

Overview

Much of the major infrastructure owned and/or managed by Amtrak was constructed in the late 1800's to early 1900's and in many cases, have surpassed their useful life. Major structures, are designed to last much longer than other assets, however deferred maintenance and rehabilitation has resulted in an asset portfolio which now urgently needs investment.

Poor conditions on major infrastructure, has an adverse impact on other asset classes. For example, the extensive deterioration of the lining in tunnels – built in the 1871 to 1934 time-period – results in water ingress which impacts track conditions through mud spots and defects in alignment, impacts signals through track circuit defects and impacts electric traction.

In addition, changes to operations particularly on the NEC main-line – the desire to run more services quicker – is hindered by the bottlenecks that exist across the network, most of which are represented by an aging structure – for example poor alignment of some tunnels prevents Amtrak's high-speed trains from operating anywhere near their design speed, which impacts our ability to deliver an optimal train schedule.

Amtrak's facilities have also suffered because of deferred maintenance and rehabilitation. Many of the facilities have had little investment in them over the last several decades.

Inventory Development

Amtrak acknowledges that the asset registry for B&B assets is lacking some data attributes. The focus to date has been to ensure safety critical assets are included. As part of an ongoing program of improvement the following issues will be addressed:

- [Age records](#) – completed as part of I-AMP2017 (NEC and NEC Branch Lines) and IALP2019 (National Assets).
- [Asset attributes](#) – are mostly completed, some gaps remain and will be addressed during the course of normal inspections. This will be undertaken under the plan period.

NEC Main Line (Amtrak Owned)

A summary of key bridges and buildings on the NEC main-line, owned by Amtrak, is shown below. In 2018 Massachusetts Bay Transportation Authority (MBTA) took over maintenance and responsibility for all infrastructure it owns along the NEC between Boston and Rhode Island state line, known locally as the Attleboro Line. These assets have been removed from this plan.

Table 30: NEC Main Line B&B Assets (Amtrak Owned)

Asset Type	Count	Unit	Av. Age	Source Notes
Undergrade Bridge	772	Each	1937	2018 Inventory Information
Movable Bridge	10	Each	1923	2018 Inventory Information
Signal Bridge	451	Each	1958	Age is an assumption, since data is incomplete
Culvert	543	Each	1898	Includes both culverts and drainage pipes (> 2 ft); average age from 2017 AMP
Bridge Ties	18,187	Each	N/A	Used same count as in 2017
Tunnel	100,476	Lin. Ft.	1910	2018 Inventory Information
Retaining Walls	79,500	Lin. Ft.	N/A	I-AMP2017
Steel Bridge Painting	95,974	Lin. Ft.	1916	I-AMP2017
Facility Floor	3,600,726	Sq. Ft.	N/A	I-AMP2017
Facility Roof	2,612,232	Sq. Ft.	N/A	I-AMP2017

Note that stations are omitted from the Infrastructure Asset Line Plans and will be included in a separate Stations Asset Line Plan.

Undergrade Bridge Assets

There are 815 undergrade bridges on the Northeast Corridor. Asset life for these bridges is estimated at 150 years. An estimated 26%, of these bridges, are not in a state of good repair. Significant bridges in need of investment include:

- The [Sawtooth Bridge](#) is an I-beam bridge that was constructed in 1910; it carries the NEC main line over the NJ Transit Morristown Line and the PATH rail line. The bridge is in a state of serious distress and is well beyond rehabilitation. In addition, it impacts opportunities for service growth and disruption recovery by reducing the corridor from four tracks to two tracks.

Signal Bridge Assets

There are 451 signal bridges on the Northeast Corridor. At a state of good repair, one signal bridge should be replaced per year based on a hundred-year life. However, some signal bridge components such as foot-walks and handrails have a shorter life and require work more often.

Retaining Wall Assets

There is estimated to be 79,500 linear feet of retaining wall on the Northeast Corridor. This includes walls located both above track level and below track level. Retaining walls have a design life of 150 years. Masonry and concrete work are required to keep these assets in a state of good repair.

Movable Bridge Assets

There are 10 movable bridges on the Northeast Corridor. The following contains a brief description and the state of good repair status for each bridge. Electrical work, mechanical work, structural work, miter rail replacement, fender system work and painting are examples of work that will be required in the future to keep these bridges in a state of good repair. Although bridges have a design life of 150 years, several have reached the end of their useful life and must be replaced.

- The [Mystic River Bridge](#) (Bridge CT 132.16) was built in 1984. The movable span is a swing-span and consists of a two track 263-foot-long through truss. The bridge is in a state of good repair.
- The [Thames River Bridge](#) (Bridge 124.09) is a vertical lift of a two track 188-foot-long through truss, and the fixed approach spans are through truss, for a total bridge length of 1,389 feet. The bridge was originally built in 1919 and had its movable span (bascule) replaced in 2008 with a vertical lift. The bridge is in a state of good repair.
- The [Shaw's Cove Bridge](#) (Bridge CT 122.65) was built in 1984. The movable span is a swing-span and consists of a two track 218-foot-long through truss. The bridge is in a state of good repair.
- The [Niantic River Bridge](#) (Bridge CT 116.74) was originally built in 1907 and replaced in 2012. The movable span is a bascule and consists of a two track 140 foot through girder. This bridge is in a state of good repair.
- The [Connecticut River Bridge](#) (Bridge CT 106.89) was built in 1907. The movable span is a bascule and consists of a two track 158-foot-long through truss, and has fixed through truss approach spans, for a total bridge length of 1,585 feet. This frequent opening and closing bridge puts high demand on its aging components. Electrical and control systems and pinion assemblies have been replaced within the past two years in order to sustain operational reliability. The track and tread were replaced in 2008/09. However, many of the elements have reached the end of their design life and require extensive maintenance to remain in operable condition. Preliminary engineering has been completed for replacement of the bridge. This bridge will be in a state of good repair after the rehabilitation or replacement is complete.
- The [Pelham Bay Bridge](#) (Bridge NY 15.73) was built in 1907. The movable span is a bascule and consists of a two track 82-foot-long through truss. The bridge has reached the end of its useful life and requires extensive ongoing maintenance. Its obsolete and aging components have forced Amtrak to restrict speeds to 45 mph. The bridge has a lift span that is manned by a bridge operator. Today, the bridge still opens frequently for marine traffic and occasionally fails to properly close, creating a block for Amtrak service between Boston and New York. Though some components have been recently upgraded, including substructure work for the approach spans done under the ARRA program, this bridge will not be in a state of good repair until the movable span is replaced and the approach span substructure completely rehabilitated. The movable span replacement cost is not included in the state of good repair backlog.
- The [Portal Bridge](#) (Bridge NJ 6.10) is a deck girder bridge constructed in 1910 and carries the NEC over the Hackensack River. The movable span is a swing-span and consists of a two track 300-foot-long through truss. The bridge is a major bottleneck and source of delay. The swing span requires routine openings for maritime traffic and, due to being functionally obsolete, experiences frequent mechanical failures. Projects completed recently include the installation of new motors and rehabilitation of the center wedge drive and installation of access stairs and railings at the west end. The fire-damaged fender system and installation of new submarine cables were done in 2008/09. Design is underway to replace the existing bridge with two, 2-track high level bridges. Preliminary funding and limited

construction commenced in 2017 for the New Portal Bridge North in 2012, however full funding for it and for the New Portal Bridge South (Design and Construction) is not yet available. This bridge will not be in a state of good repair until it is replaced.

- [Dock Bridge](#) (Bridge NJ 8.50), was built in 1935 and crosses the Passaic River. There are three vertical lift movable spans. Each of these vertical lift movable spans consists of a 230-foot-long through truss with the number of tracks varying from one to three. PATH maintains the span and track on the span with two tracks. This bridge requires substantial rehabilitation and will not be in a state of good repair until work is completed - including paint protection, electrical and mechanical replacement, and lift system component replacement.
- The [Susquehanna River Bridge](#) (Bridge MD 60.07) is deck truss – pin connected bridge, with a center spring span to increase vertical clearance for water traffic from the nominal 52 feet. The bridge was built in 1906, and runs 4,154 ft. The movable span is a swing-span and consists of a two track 280-foot-long through truss. The current condition of the bridge requires reduced vehicle speeds. In addition, the bridge reduces the corridor from four tracks to two tracks. Preliminary engineering and the required NEPA Environment Assessment were completed in 2017. Funding for the bridge replacement has not yet been identified. This bridge will not be in a state of good repair until it is replaced.
- The [Bush River Bridge](#) (Bridge MD 72.14) was built in 1913. The movable span is a bascule and consists of a two track 43-foot-long through girder, and has fixed concrete slab approach spans, for a total bridge length of 2,752 feet. This bridge will not be in a state of good repair until it is replaced.

Tunnel Assets

There are thirteen tunnels on the Northeast Corridor totaling 100,476 linear feet. This does not include overbuilds such as Back Bay in Boston. The following contains a brief description and the state of good repair status for each tunnel. There is a separate tunnel Fire and Life Safety program, which is not addressed in the following.

- The [First Street Tunnel](#) (milepost 135.92), in Washington, DC is two track stone lined 4,033-foot-long tunnel built in 1904. Lighting, electric power, ventilation and tunnel liner rehabilitation is planned in the next five to ten years. This tunnel will be in a state of good repair after this work is complete.
- The [Baltimore and Potomac Tunnel](#) is approximately 1.4 miles long and comprised of three shorter tunnels: the John Street Tunnel (MD 96.11), the Wilson Street Tunnel (MD 96.60), and the Gillmor Street Tunnel (MD 97.22). The three tunnels were constructed in 1873 and rehabilitated in the 1980's. The tunnels currently require constant maintenance due to water ingress and the floor slab sinking. In addition, the existing tunnel alignment hinders operations – reducing train speeds, increasing travel time and impacts Amtrak's ability to provide high-speed services. This tunnel will not be in a state of good repair until it is replaced. The preliminary engineering and NEPA-Environment Impact Statement for the replacement of this tunnel was completed in 2017. Final Engineering is continuing, however full funding for the replacement still needs to be obtained.
- The [Old Union Tunnel](#) (MD 94.94), is a two-track brick lined 3,403-foot-long tunnel built in 1871. Lighting and fire protection standpipe upgrades, and drainage rehabilitation are planned in this tunnel in the next five years. This tunnel will be in a state of good repair after this work is complete.
- The [New Union Tunnel](#) (MD 94.93), is a two-track brick lined 3,406-foot-long tunnel built in 1934. Lighting and fire protection standpipe upgrades are planned in the next five years. This tunnel will be in a state of good repair after this work is complete.

- The South Tube of the [North \(Hudson\) River Tunnel](#) (NY 1.68), is a single-track cast iron and concrete lined 13,393-foot-long tunnel built in 1910. The tunnel is operational and safe; however, it was significantly damaged by Superstorm Sandy in 2012. The tunnel today continues to deteriorate due to deposits of corrosive minerals causing ongoing damage to the bench walls, embedded steel, track, and signals and electrical components. Waterproofing is planned for this tunnel in the next five years, and structural rehabilitation in the next ten years. This tunnel will be in a state of good repair after this work is complete.
- The North Tube of the [North \(Hudson\) River Tunnel](#) (NY 1.69), is a single-track cast iron and concrete lined 13,393-foot-long tunnel built in 1910. The tunnel is operational and safe; however, it was significantly damaged by Superstorm Sandy in 2012. The tunnel today continues to deteriorate due to deposits of corrosive minerals causing ongoing damage to the bench walls, embedded steel, track, and signals and electrical components. Waterproofing is planned for this tunnel in the next five years, and structural rehabilitation in the next ten years. This tunnel will be in a state of good repair after this work is complete.
- The [East River Tunnel](#) consists of four tubes that connect Manhattan to Long Island and are used for Amtrak and MTA Long Island Rail Road services.
 - Line 1 of the [East River Tunnel](#) (NY 1.43), is a single-track cast iron lined 12,780-foot-long tunnel built in 1910. Waterproofing is planned for this tunnel in the next five years, and structural rehabilitation in the next ten years. This tunnel will be in a state of good repair after this work is complete.
 - Line 2 of the [East River Tunnel](#) (NY 1.44), is a single-track cast iron lined 11,792-foot-long tunnel built in 1910. Waterproofing is planned for this tunnel in the next five years, and structural rehabilitation in the next ten years. This tunnel will be in a state of good repair after this work is complete.
 - Line 3 of the [East River Tunnel](#) (NY 1.45), is a single-track cast iron lined 12,917-foot-long tunnel built in 1910. Waterproofing is planned for this tunnel in the next five years, and structural rehabilitation in the next ten years. This tunnel will be in a state of good repair after this work is complete.
 - Line 4 of the [East River Tunnel](#) (NY 1.46), is a single-track cast iron lined 12,682-foot-long tunnel built in 1910. Waterproofing is planned for this tunnel in the next five years, and structural rehabilitation in the next ten years. This tunnel will be in a state of good repair after this work is complete.
- The [East Haven Tunnel](#) (CT 76.64), is a two-track brick lined 1,179-foot-long tunnel built in 1893. Waterproofing and drainage rehabilitation are planned for this tunnel in the next five years to ten years. This tunnel will be in a state of good repair after this work is complete.

NEC Branch Lines (Amtrak Owned)

A summary of key bridges and buildings infrastructure owned by Amtrak on the Northeast Corridor branch lines is shown below.

Table 31: NEC Branch Line B&B Assets (Amtrak Owned)

Asset Type	Count	Unit	Av. Age	Source Notes
Undergrade Bridge	336	Each	1913	2018 Inventory Information
Movable Bridge	1	Each	1901	2018 Inventory Information
Signal Bridge	91	Each	1958	Age is an assumption, since data is incomplete
Culvert	383	Each	1915	2018 Inventory Information
Bridge Ties	8,582	Each	N/A	Used same count as in 2017
Tunnel	2,681	Lin. Ft.	1955	2018 Inventory Information
Retaining Walls	6,700	Lin. Ft.	N/A	I-AMP2017
Steel Bridge Painting	32,905	Lin. Ft.	1923	I-AMP2017
Facility Floor	494,233	Sq. Ft.	N/A	I-AMP2017
Facility Roof	288,623	Sq. Ft.	N/A	I-AMP2017

Notes

1. Stations are omitted from the Infrastructure Asset Line Plans and will be included in a separate Stations Asset Line Plan.
2. The above asset counts are for all line codes considered NEC Branch Lines – including Post Road and Dorchester Branch. The counts will therefore exceed the sum of the numbers in the paragraphs below as we have not presented summaries of these two short lines.

Harrisburg Line

Undergrade Bridge Assets

There are 197 undergrade bridges on the Philadelphia to Harrisburg Line. An estimated 20% of these bridges are not in a state of good repair. Concrete, masonry, steel and drainage work; complete replacements, partial replacements and painting are examples of work that will be required in the future to return the 20% to a state of good repair and keep the 80% in a state of good repair.

Signal Bridge Assets

There are 79 signal bridges on the Philadelphia to Harrisburg Line. At a state of good repair, approximately one signal bridge should be replaced per year based on a hundred-year life.

However, some signal bridge components such as foot walks and handrails have a shorter life and require work more often. There are ongoing projects on the Harrisburg Line to upgrade signal bridges in the Capital Program.

Culvert Assets

There are 142 culverts on the Philadelphia to Harrisburg Line. At a state of good repair, approximately two culverts should be replaced per year based on an eighty-year life. There are multi-year projects continuing to replace and upgrade these culverts.

Retaining Wall Assets

There are 4,000 linear feet of retaining wall on the Philadelphia to Harrisburg Line. This includes walls located both above track level and below track level. Masonry and concrete work are required to keep these assets in a state of good repair.

Springfield Line

Undergrade Bridge Assets

There are 74 undergrade bridges on the New Haven to Springfield Line. An estimated 13% of these bridges are not in a state of good repair. Concrete, masonry, steel, drainage, complete replacements, partial replacements, and painting are examples of work that will be required in the future to return the 13% to a state of good repair and keep the 87% in a state of good repair.

Bridge Tie Assets

There are 2,272 timber bridge ties on open deck bridges on the New Haven to Springfield Line. At a state of good repair, 125 bridge ties should be replaced per year based on a twenty-year life. However, the actual number of bridge ties replaced per year will vary based on the bridge length. Of these bridge ties, 1,160 are on CT 49.73 and will need to be replaced in the next five years. This asset is currently in a state of good repair.

Culvert Assets

There are 134 culverts on the New Haven to Springfield Line. At a state of good repair, 1.5 culverts should be replaced per year based on an eighty-year life.

Retaining Wall Assets

There are 2,700 linear feet of retaining wall on the New Haven to Springfield Line. Masonry and concrete work are required to keep these assets in a state of good repair.

Albany Line

Movable Bridge Assets

There are two movable bridges on the New York to Albany Line. The following contains a brief description and the state of good repair status for each bridge. Electrical work, mechanical work, structural work, miter rail replacement, fender system work and painting are examples of work that will be required in the future to keep these bridges in a state of good repair.

- The [Livingston Avenue \(Lab\) Bridge](#) (Bridge NY 143.02), over the Hudson River was built in 1902. The movable span is a swing-span and consists of a two track 262-foot-long through truss. Miter rail renewal and a full electrical mechanical rehab is planned for this bridge in the next two years. Additional replacement of the fender system and substructure rehab are required in order to bring this bridge into a state of good repair. Presently the State of New York is leasing the bridge from CSX and is responsible for funding these repairs.
- The [Spuyten Duyvil Bridge](#) (Bridge NY 10.20) over the Harlem River, was built in 1901. The movable span is a swing-span and consists of a single track 280-foot-long through truss. Amtrak has 100% responsibility for this bridge. The bridge has been struck by barges in the past and has periodic operational problems. The bridge also sustained damage due to flooding during Superstorm Sandy in 2012. A full mechanical/electrical rehab of the components underneath the bridge deck was completed in 2018. A new fender system on the east end of the bridge is planned for 2019. The bridge will be in a state of good repair after these issues are addressed.

Tunnel Assets

There is one tunnel on the New York to Albany Line totaling 1,584 linear feet. This does not include overbuilds such as Riverside Park. This tunnel is not in a state of good repair with an SOGR score of 2.

Undergrade Bridge Assets

There are 126 undergrade bridges on the New York to Albany Line (including the Empire Connection). An estimated 13% of these bridges are not in a state of good repair. Concrete, masonry, steel, drainage, complete replacements, partial replacements, and painting are examples of work that will be required in the future to return the 13% to a state of good repair and keep the 87% in a state of good repair.

Bridge Tie Assets

There are 4,746 timber bridge ties on open deck bridges on the New York to Albany Line. At a state of good repair, 85 bridge ties should be replaced per year based on a twenty-year life. However, the actual number of bridge ties replaced per year will vary based on the bridge length.

Culvert Assets

There are 70 culverts on the New York to Albany Line.

State of New York Supported Assets

Summary of key bridges and buildings infrastructure leased from CSX and capital funded by the State of New York is shown below.

Table 32: NEC Branch Line B&B Assets (Leased from CSX and capital funded by the State of New York)

Asset Type	Count	Unit	Av. Age	Source Notes
Undergrade Bridge	62	Each	1914	2018 asset inventory
Movable Bridge	1	Each	1902	Lab bridge is leased from CSX by the State of New York
Signal Bridge	9	Each	1922	Age is an assumption, since data is incomplete
Tunnel	57	Lin. Ft.	1912	2018 asset inventory

National Network (Amtrak Owned)

A summary of key bridges and buildings on the national network, owned by Amtrak is shown below.

Table 33: National Network B&B Assets (Amtrak Owned)

Asset Type	Count	Unit	Av. Age	Source Notes
Undergrade Bridge	50	Each	1912	2018 Inventory Information
Movable Bridge	2	Each	1910	2018 Inventory Information
Signal Bridge	4	Each	N/A	Age data is incomplete
Facility Floor	1,779,582	Sq. Ft.	N/A	2017 Inventory Information
Facility Roof	1,212,657	Sq. Ft.	N/A	2017 Inventory Information

Undergrade Bridge Assets

There are 132 undergrade bridges on the national network, 47 of which are in the Central Division, mostly in Michigan. An estimated 55% of these bridges are not in a state of good repair. Concrete work, masonry work, steel work, drainage work, complete replacements, partial replacements, and painting are examples of work that will be required in the future to return the 55% to a state of good repair and keep the 45% in a state of good repair.

Movable Bridge Assets

There are 2 movable bridges on the Central Division. The following contains a brief description and the state of good repair status for each bridge. Electrical, mechanical, structural, miter rail replacement, fender system work and painting are examples of work that will be required in the future to keep these bridges in a state of good repair.

- Bridge IN 228.47 crosses Trail Creek and was built in 1902. The movable span is a swing-span and consists of a single track 192-foot-long through truss. Rehabilitation of the drive machinery at this bridge is planned in the next five years.
- Bridge IL 466.20 crosses the South Branch of the Chicago River and was built in 1914. The movable span is a vertical lift and consists of a two track 277-foot-long through truss. Future projects include replacement of the counterweight ropes and electrical and mechanical upgrades.

Bridge Tie Assets

There are 883 timber bridge ties on open deck bridges on the Central Division. At a state of good repair, 44 bridge ties should be replaced per year based on a twenty-year life. However, the actual number of bridge ties replaced per year will vary based on the bridge length. This asset is currently in a state of good repair.

Culvert Assets

There are 67 culverts on the Central Division. At a state of good repair, approximately one culvert should be replaced per year based on an eighty-year life.

State of Michigan Supported Assets

A summary of key bridges and buildings infrastructure on the national network, owned by the State of Michigan is shown below.

Table 34: National Network B&B Assets (Owned by the State of Michigan)

Asset Type	Count	Unit	Av. Age	Source Notes
Undergrade Bridge	77	Each	1915	2018 Inventory Information
Culvert	4	Each	1894	2018 Inventory Information
Facility Floor	819,072	Sq. Ft.	N/A	2017 Inventory Information
Facility Roof	779,852	Sq. Ft.	N/A	2017 Inventory Information

B&B Asset Condition

Amtrak's B&B Department conducts a program of condition monitoring activities to identify faults, prioritize intervention and ensure safe operation of the railroad. Additionally, condition assessments are undertaken as part of Amtrak's Bridge Management Program where regular assessment of bridge components takes place to support prediction of the optimal point of repair/replacement.

Overview

Bridge Condition Monitoring

Amtrak Engineering currently conducts an extensive condition monitoring (inspection) program of bridge infrastructure assets at intervals in line with Amtrak's Bridge Management Program manuals and procedures and with FRA requirements. The current monitoring activities ensure safe operation of the railroad. They are used to identify faults and potential faults which result in prioritized and scheduled maintenance and capital needs. Table 36 summarizes the Bridges monitoring program.

Table 35: Summary of Bridge Condition Monitoring Activities

Activity	Scope/ Description
Fixed Bridges	
Condition Assessment and Defect Identification (Annual)	<ul style="list-style-type: none"> → Comprehensive visual assessment of bridge components with standard scoring from 0-6. → Defects coded as emergency and non-emergency. → Covers undergrade bridges, signal bridges, public overhead highway bridges, and private overhead bridges.
Condition Assessment and Defect Identification (Semi-Annual)	<ul style="list-style-type: none"> → Visual assessment of deck components and rail fasteners of open deck and undergrade bridges. → Pin connections of undergrade through and deck truss bridges.
Special Inspections (As Needed)	→ Comprehensive inspections required for emergency situations (i.e. incidents) or unusual conditions.
Real Time Monitoring	→ Sensors to monitor critical bridges including: load, vibrations, movement, etc.
Testing and Analysis	→ Concrete and Steel Corrosion Testing and Analysis (sampling, BEM, etc.).
Cyclical Maintenance	<ul style="list-style-type: none"> → Concrete and steel surface painting, coating, waterproofing etc. → Replacement / rehab of expansion joints.
Movable Bridges	
Monthly and Quarterly Inspections	→ Movable Bridges - Monthly comprehensive inspections cables, electrical equipment, machinery, miter rails, shoes, etc.
Monthly and Quarterly Detailed Assessments	→ Detailed assessment and measurement of miter rails and expansion joints completed in parallel with monthly/quarterly assessments.
Other Bridges and Structures	
Monthly Inspections - Bridges Over Waterways	<ul style="list-style-type: none"> → Monthly comprehensive inspections and as-needed. → Underwater: Inspect foundations for scour. Substructures receive periodic diving inspections. → With sounding line, measuring probe, or hydrographic instrument, record soundings around all in-water piers, and abutments. → Flash floods: special inspections after flooding incidents (Track Inspection Foreman and Bridge Inspector).
Tunnel Inspections (Annual)	→ Conventional tunnels (constructed by mining or boring). Cut & cover type structures and overbuilds are treated as overhead highway bridges and inspected at the same frequency required for such highway structures.
Culvert Inspections (Yearly)	→ Timing of these inspections may vary to take advantage of the lack of vegetation or dry periods.

The current monitoring activities ensure safe operation of the railroad. The condition assessments performed as part of the Bridge Management Program allow for predictive analysis to determine the rate of deterioration of components and to predict future bridge conditions.

This condition code scale will be mapped to align with other Amtrak Engineering asset classes as described in the following section under assessment methodology. With an assessed condition, Amtrak is able to accurately

assess the State of Good Repair (SOGR) of its assets, in order to inform future investment needs and prioritization.

Facilities Condition Monitoring

For Facilities, Amtrak currently employ outside resources to undertake facilities condition assessments. The results are provided in a report for Amtrak engineers to utilize. Assets include:

- Civil/Landscape
- Building Exterior
- Building Interior
- HVAC
- Electrical
- Plumbing
- Fire/Life Safety & Security

Amtrak currently does not undertake any predictive analysis and the data is not mapped back to assets in the CMMS. This condition code scale will be mapped to align with other Amtrak Engineering infrastructure assets as described in the following section under assessment methodology.

Asset Condition Assessment methodology

Pursuant to 49 U.S.C § 24904(c) Amtrak is required to undertake a “condition assessment of those inventoried assets for which a provider has direct responsibility and to level of detail to monitor and predict performance of assets and inform investment prioritization” (U.S. 49 CFR § 625.25(b)(2)).

In meeting this obligation, Amtrak has further developed its bridges and tunnels asset condition assessment guide⁹. The approach is fully aligned to current practices, and aligned to Engineering’s overall asset condition assessment framework. Amtrak has also developed a Facilities¹⁰ condition assessment guide. The guide builds off industry good practice – including facility condition assessment guidelines provided by the Federal Transit Administration. An implementation plan for facilities assessments is currently being developed.

The guides assess a series of condition factors, each graded between zero (asset is non-operable) through five (asset is new or nearly new). The approach will result in a condition index for each asset and will enable assessment of SOGR. Amtrak considers an asset to be in SOGR when it is in a condition where it can continue to meet and perform the functional requirements for which it was designed to do and when the lifecycle investment needs of the asset have been met. This definition is consistent with the definition laid out in U.S. 49 CFR § 625. Amtrak grades an asset in SOGR if it scores 2.5 on its updated condition assessment framework, described above.

For Bridges and Buildings, IALP2019 has used the physical assessment of assets conducted during 2017 and 2018 in accordance with the asset condition guides. For Facilities the assessment was based on the age of the asset. This will continue to be implemented through 2019 and 2020.

⁹ Infrastructure Asset Condition Guidelines – Bridges and Tunnels. Version 3, Issued October 2018.

¹⁰ Infrastructure Asset Condition Guidelines – Facilities. Version 3, Issued October 2018.

IALP 2019 – Assessed B&B Asset Condition

For IALP2019 the assessed condition of B&B assets, based on both assessed condition (bridges and buildings) and useful life (facilities) is summarized in Table 36 and Table 38 below.

Table 36: 2019 Assessed Condition of B&B assets – owned by Amtrak - based on asset assessment

Asset Type	NEC Main Line		NEC Branch Line		National Network	
	Average SOGR	% not in SOGR	Average SOGR	% not in SOGR	Average SOGR	% not in SOGR
Undergrade Bridge	3.15	25.8%	2.79	38.4%	2.70	44.0%
MovableBridge	3.33	20.0%	2.00	100.0%	2.50	50.0%
Signal Bridge	3.23	0.0%	3.19	1.1%	3.00	0.0%
Culvert	3.01	0.0%	3.04	0.0%	N/A	N/A
Bridge Ties	N/A	N/A	N/A	N/A	N/A	N/A
Tunnel	1.96	100.0%	1.33	100.0%	N/A	N/A
Retaining Walls	N/A	40.0%	N/A	53.0%	N/A	0.0%
Steel Bridge Painting	2.77	34.0%	2.80	27.5%	-	0.0%
Facility Floor	2.41	9.4%	2.51	93.0%	2.38	91.5%
Facility Roof	2.41	38.4%	2.51	89.7%	2.38	87.5%

Note:

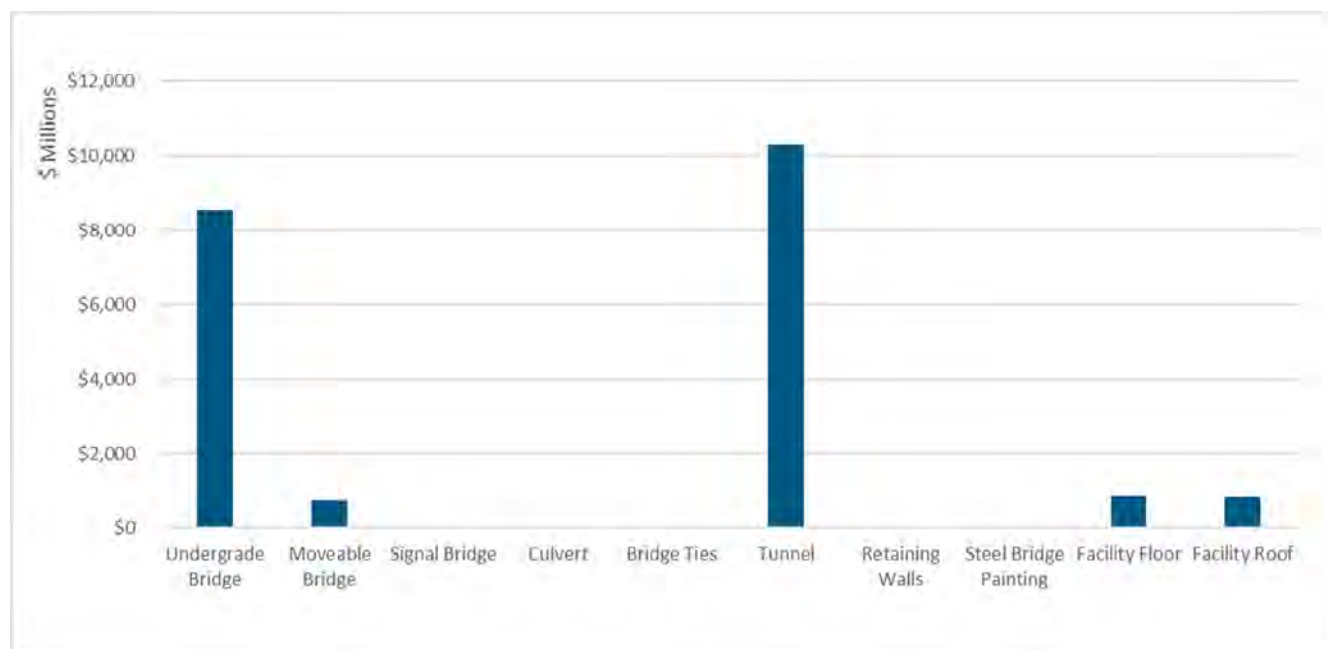
1. Bridge ties are N/A because no age data was available.
2. The % Not in SOGR of retaining wall assets have been assessed by Engineering staff.

Table 37: 2019 Assessed Condition of B&B assets – maintain and operated by Amtrak and owned by others - based on asset assessment

Ownership	Leased from CSX, Capital Funded by State of NY		Owned by State of Michigan	
Asset Type	Average SOGR	% not in SOGR	Average SOGR	% not in SOGR
Undergrade Bridge	2.68	41.9%	2.36	67.5%
MovableBridge	2.00	100.0%	N/A	N/A
Signal Bridge	3.22	0.0%	N/A	N/A
Culvert	N/A	N/A	2.00	100.0%
Bridge Ties	N/A	N/A	N/A	N/A
Tunnel	2.00	100.0%	N/A	N/A
Retaining Walls	N/A	100.0%		0.0%
Steel Bridge Painting	-	0.0%		0.0%
Facility Floor	N/A	N/A	2.21	98.9%
Facility Roof	N/A	N/A	2.21	98.8%

The replacement value of B&B assets with a condition rating below 2.5 which are assessed as nearing the end of their useful life is estimated to be **over \$21.3 billion in 2018 dollars**. This is Amtrak's SOGR Backlog for bridges and buildings assets. The largest portion of this is attributed to the NEC main-line and branch-line assets owned by Amtrak, which is estimated to be over \$17.9 billion in 2018 dollars, with tunnels accounting for nearly 60% of this. An additional \$676 million backlog is present on the CSX leased lines which are capital funded by the State of New York. The national network accounts for \$1.3 billion in backlog, with an additional \$1.47 billion backlog on the Michigan owned infrastructure. Figure 26 presents the backlog by B&B asset type.

Figure 26: B&B Estimated SOGR Backlog by Asset Type (\$m 2018)



It should be noted that this is the estimated value of assets that are past their useful life and which need replacement. It is not the forecast project costs associated with replacing these assets. The total value is based on unit rates proposed by Amtrak Finance and confirmed by the Deputy Chief Engineer Structures. It is noted that many of the highest priorities for SOGR are also identified as opportunities for network performance improvement (for example infrastructure assets under the Gateway Program). This figure does not consider the proposed project costs of these capital improvement programs.

Risk Management

Risk management continues to be introduced through IALP2019 to support decision making, planning and prioritization.

Overview

The FAST Act requires that both asset and asset management risks are captured in such a way to inform investment prioritization and establish implementation strategies.

Currently, risk management occurs across Engineering and is very much focused on maintaining a safe railroad operation. For B&B infrastructure assets this is achieved through a comprehensive inspection and condition monitoring program summarized above. This approach ensures that the railroad is maintained to meet minimum safety standards.

Amtrak acknowledges the lack of established risk analysis, evaluation and management processes for managing longer-term and non-safety risks. As part of I-AMP2017, Amtrak conducted a basic risk identification exercise for B&B assets and asset management practices. This has been revisited as part of IALP2019.

Amtrak Engineering intends to continue to develop its risk management processes – by establishing a ‘known concerns’ log and by updating and monitoring the risks identified in this asset strategy as part of the annual asset line plan development.

B&B Risk Register

The risk register provided in Table 38 has been captured through consultation with Amtrak B&B Engineering staff. Risks have been identified and where possible management actions established.

Risks are grouped in the categories identified in appendix A. The service objective(s) – from the Asset and Asset Management Performance section impacted by the risk are also noted.

Table 38: B&B – Asset and Asset Management Risk Register

(Unless noted, risks apply to all asset types – bridges, structures and facilities)

Ref:	Route Impact	Risk description	Risk impacts (service objectives)	Existing/ planned control
Corporate/ Financial risks				
BB001	All	Lack of project funding, results in deteriorating assets that do not meet service requirements and impacts our ability to provide safe and reliable infrastructure and improve network performance.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 5. Improve Network Performance	→ No actions planned
BB002	All	Mega projects require multiple states' commitment. In many instances there is not common agreement on project outputs and where funding will come from (or indeed if at all). This results in projects which are not fully funded, which impacts Amtrak's ability to fully deliver committed to projects.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 5. Improve Network Performance	→ No actions planned
BB003	All	The level of effort required by Amtrak Engineering to obtain funding commitment is not comparable to other transportation systems – where the carrier does not normally engage in funding issues. This is time-consuming, and generally does not assist with moving the project forward.	2. Obtain funding and financing for infrastructure investment	→ No actions planned
BB004	NEC Only (not facilities)	Major projects require additional real estate for staging, results in increased costs for capital projects and impacts our ability to obtain funding.	2. Obtain funding and financing for infrastructure investment	→ No actions planned

Organization risks				
BB005	NEC Only	Labor agreements allow senior staff to 'bid-out', which results in a lack of qualified staff filling roles and impacts our ability to deliver maintenance efficiently.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery 5. Improve Network Performance	→ Planned: Reexamine labor agreements to improve ability to retain qualified staff and decrease qualified staff bidding out for other jobs
BB006	NEC Only	Staff attrition (including imminent retirement) results in reduction of qualified and experienced bridge and building resources, and impacts our ability to deliver work and support other departments.	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	→ Planned: Review resource needs as part of wider Engineering Department resource study → Planned: Plan for impact of voluntary separation on B&B resource levels
Asset management Risks				
BB007	All	Projects are constructed over decades – which introduces risks related to code compliance, and managing the asset, which results in ineffective decision-making and impacts our ability to deliver work efficiently.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery	→ No actions planned
BB008	All	Poor quality and missing information (including data attributes, data structures and information about certain assets) results in ineffective decision making and impacts our ability to prepare long-term plans.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery	→ Current: B&B capital program informed by local knowledge that drives prioritization for replacement → Planned: Asset registry improvement activities as identified in this plan
BB009	All	Poor management of 3 rd party agreements, easements, etc. results in unknown risks and could impact construction projects.	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	→ Planned: Identify all known 3 rd party agreements and easements
Asset risks				
BB010	NEC (B&P Tunnel only)	The current condition of the Baltimore and Potomac Tunnel, results in unfavorable infrastructure	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	→ Current: Managed through ongoing monitoring and inspection

		conditions requiring constant maintenance. In addition, the alignment of the tunnel results in reduced train speeds. These factors impact our ability to provide a reliable infrastructure and our ability to support improved network performance.		→ Planned: Replacement of B&P tunnel with a new four track tunnel and an improved alignment, would both improve reliability and accommodate demand for future train service. Requires Funding.
BB011	NEC (Susquehanna River Bridge only)	The current condition of the Susquehanna River Bridge, results in reduced operational performance (reduced speeds), as well as increased operational costs (movable bridge) and impacts our ability to provide a reliable infrastructure. The current two track capacity results in a bottleneck and impacts our ability to support improved network performance.	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	→ Current: Managed through ongoing monitoring and inspection → Planned: Replacement of Susquehanna River Bridge with two parallel two-track fixed bridges each high enough to allow boats to pass without opening. Requires Funding.
BB012	NEC (Sawtooth Bridge only)	The current condition of the Sawtooth Bridge results in increased hazards due to severe deterioration and impacts our ability to continue providing a reliable infrastructure. The current two track capacity results in a bottleneck and impacts our ability to support improved network performance.	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	→ Current: Managed through ongoing monitoring and inspection → Planned: Replace existing distressed two-track structure with a four-track crossing, increasing design speed from 60mph to 90mph, improving efficiency and reliability on the NEC. Requires Funding.
BB013	NEC (Portal North Bridge only)	The current condition of the Portal Bridge results in increased risk of unplanned outages due to malfunctioning of the obsolete movable bridge components, and impacts our ability to provide a reliable infrastructure and our ability	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	→ Current: Managed through ongoing monitoring and inspection → Planned: Replacement of Portal North Bridge with a new high-level, fixed span bridge that would eliminate future malfunctions. Requires Funding.

		to support improved network performance.		
BB014	NEC (North River Tunnel only)	Damage to the North River Tunnel from Hurricane Sandy in 2012 has resulted in rapid and ongoing deterioration of the tunnel structure and it impacts our ability to provide a reliable infrastructure and our ability to support improved network performance.	1. Provide safe and reliable infrastructure for train services 5. Improve Network Performance	<ul style="list-style-type: none"> → Current: Managed through ongoing monitoring and inspection → Planned: Construction of a new two track tunnel (Hudson Tunnel), to allow for the existing North River Tunnel to be closed for reconstruction. Requires Funding.
BB015	NEC (East River Tunnel only)	The continually worsening conditions of the East River Tunnel results in a tunnel that requires constant maintenance and impacts our ability to provide a reliable infrastructure.	1. Provide safe and reliable infrastructure for train services	<ul style="list-style-type: none"> → Current: Managed through ongoing monitoring and inspection → Planned: Rehabilitation of all four tunnels. Requires Funding.
BB016	NEC (Pelham Bay Bridge only)	The current condition of the Pelham Bay Bridge results in increased risk of unplanned outages due to malfunctioning of the obsolete movable bridge components, and it impacts our ability to provide a reliable infrastructure and our ability to support improved network performance.	1. Provide safe and reliable infrastructure for train services	<ul style="list-style-type: none"> → Current: Managed through ongoing monitoring and inspection → Planned: Replacement with a new high level fixed bridge with clearance for marine traffic. Requires Funding.
BB017	National (Canal Street Railroad Bridge, Chicago only)	The current condition of the Canal Street Railroad Bridge, Chicago results in increased risk of unplanned outages due to malfunctioning of the obsolete movable bridge components, and impacts our ability to provide a reliable infrastructure.	1. Provide safe and reliable infrastructure for train services	<ul style="list-style-type: none"> → Current: Managed through ongoing monitoring and inspection
BB018	All	Changes in land use of neighboring properties results in localized flooding risk and potential asset	1. Provide safe and reliable infrastructure for train services	<ul style="list-style-type: none"> → Planned: Identify locations prone to flooding and consider asset

		failures, and it impacts reliability and our ability to quickly recover service.		resiliency improvements based on risk
BB019	All	Condition of aging culverts results in increased risk of unplanned outages, and it impacts our ability to provide a reliable infrastructure.	1. Provide safe and reliable infrastructure for train services	→ Current: Managed through a program of condition assessment
BB020	NEC (Wilmington Facility)	The current condition of Wilmington Maintenance Facility results in increased risk of potential asset failure, and it impacts our ability to maintain infrastructure.	1. Provide safe and reliable infrastructure for train services	→ Current: Managed through ongoing inspection and monitoring → Planned: Review potential consolidation of Facilities
BB021	NEC (Sunnyside New York Facility)	The current condition of Sunnyside New York Facility results in increased risk of potential asset failure, and it impacts our ability to maintain infrastructure.	1. Provide safe and reliable infrastructure for train services	→ Current: Managed through ongoing inspection and monitoring → Planned: Review potential consolidation of Facilities
BB022	National (Beech Grove, Indiana Facility)	The current condition of the Beech Grove, Indiana Facility results in increased risk of potential asset failure, and it impacts our ability to maintain equipment.	1. Provide safe and reliable infrastructure for train services	→ Current: Managed through ongoing inspection and monitoring → Planned: Review potential consolidation of Facilities
BB023	National (Chicago, Illinois Maintenance Facility)	The current condition of the Chicago, Illinois Maintenance Facility results in increased risk of potential asset failure, and it impacts our ability to maintain equipment.	1. Provide safe and reliable infrastructure for train services	→ Current: Managed through ongoing inspection and monitoring → Planned: Review potential consolidation of Facilities
BB024	National (Hialeah, Florida Maintenance Facility)	The current condition of the Hialeah, Florida Maintenance Facility results in increased risk of potential asset failure, it and impacts our ability to maintain equipment.	1. Provide safe and reliable infrastructure for train services	→ Current: Managed through ongoing inspection and monitoring → Planned: Review potential consolidation of Facilities
BB025	National	The New Orleans facility is located in a flood zone, which results in	1. Provide safe and reliable infrastructure for train services	→ No actions planned



	(New Orleans, Louisiana Facility)	localized flooding risk and potential asset failures, and it impacts our ability to maintain equipment.		
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B&B Asset Strategy

Lifecycle management strategies updated as part of IALP2019 capture the normalized or steady state activities necessary to maintain a steady state of good repair and ensure B&B assets are functional and able to continue to support a safe, efficient and sustainable national rail network.

Overview

The current B&B lifecycle management approach is reactive, determined by engineering judgement (including assessment of risk through inspections) and focused on maintaining safe rail operations.

Amtrak maintain robust and consistent processes for the lifecycle management of bridges and buildings that are consistent with and, in many areas (movable bridges for example), go beyond FRA requirements. For facilities, Amtrak has developed a facilities maintenance management manual.

In I-AMP2017, Amtrak has updated its review of the lifecycle strategies for bridges and buildings assets. The approach is consistent with other infrastructure classes. Its purpose is to develop the long-term infrastructure maintenance and improvement program to reach a state of good repair. Amtrak Engineering recognizes that to achieve this requires addressing a sizeable backlog in infrastructure investment before a program of steady state or normalized maintenance can be adopted.

The lifecycle management strategies for B&B assets laid out in the following sections define the approach adopted for the 2019 program and the revised approach for the years following to address backlog and approach steady state for state of good repair and maintenance spend. In a number of instances, we have laid out specific strategies for the asset – these are considered top priorities and consistent with content presented by our industry partners.

Current Asset Strategies

The current lifecycle management strategies employed by Amtrak to achieve its B&B asset objectives are described in Table 39. These strategies have been applied to determine the 2019 work bank.

The aim of the B&B Department is to maintain and improve the condition of the B&B infrastructure to minimize the risk to safety and train service impact. Work is categorized into the following:

- Inspection/ monitoring activities to confirm the asset is able to function in its required state and provide a safe operational environment.
- Preventive maintenance activities to achieve a required level of asset performance and maintain a safe operational environment.
- Corrective maintenance activities to return the asset to its required function and restore a safe operational environment.
- Capital maintenance to restore the asset to an operational design standard and maintain performance.
- Capital replacement to renew the asset and maintain performance.
- Capital improvement to replace the asset and improve performance or network capability.

Table 39: Current Lifecycle Management Strategies

Category	Description
Bridges	
Inspection/ Monitoring	<ul style="list-style-type: none"> → Annual Bridge inspections utilizing a 0-6 scale, identify defects or potential defects at a component level and are used to drive the capital plan. → Comprehensive follow-up and monitoring of all bridges rated at 6,5 and 4. Inspection programs designed for each asset. → Monthly and quarterly program of comprehensive inspections of all movable bridge components. → Monthly and quarterly inspection of all movable bridges over waterways. → Special inspections following bridge movements (movable bridges) or flood events. → Real time monitoring of critical bridges, including load, vibrations, movement etc.
Preventive Maintenance	→ Preventive maintenance undertaken as per Amtrak bridge maintenance management manuals.
Capital Maintenance	→ Significant level of capital maintenance undertaken on bridges to maintain the asset in service. Generally accomplished through selective component replacement to maintain safe operation.
Capital Replacement	→ Capital replacement strategies as detailed below.
Capital Improvement	→ Capital improvement strategies as detailed below.
Facilities	
Inspection/ Monitoring	<ul style="list-style-type: none"> → Building inspections are scheduled every 5 years utilizing a “Good” to “Very Poor” scale to assess the integrity of the SOGR of the site, building envelop and asset systems and to verify compliance with local codes. → Each building system category is assessed based on overall appearance and condition, and its equipment/components rated accordingly. → A priority scale is used to access each component (rates life safety, SOGR, efficiency, and others). → Comprehensive follow-up for poorly rated buildings / building systems. → Engineering is notified of conditions requiring immediate attention.
Preventive Maintenance	→ Preventive maintenance undertaken as per Amtrak building maintenance management manuals.
Capital Maintenance	→ Provided for building systems to maintain assets in service. Generally accomplished through a selective process based on the results of building inspections and findings during maintenance procedures. Assets are proposed based on SOGR inspections and selected based on their criticality, such as safety, customer service, regulatory or code compliance.
Capital Replacement	→ Capital replacement is provided for building systems to replace assets which are no longer in SOGR. Generally accomplished through a selective replacement process, assets are proposed based on the results of building inspections or maintenance conclusions and are selected based on criticality such as safety, customer service, and regulatory or code compliance.
Capital Improvement	→ Capital improvement is provided for building systems to replace assets which are either no longer in SOGR or “outdated” and not in compliance with present standards or codes. Generally accomplished through a selective improvement process, assets are proposed based on the results of building inspections and/or compliance and selected based on criticality such as safety, customer service, and regulatory or code compliance.

Moving Towards Normalized or Steady State Maintenance

Overall Approach

For B&B, Amtrak Engineering has undertaken a similar review as taken with other infrastructure asset classes to determine the necessary replacement lifecycle to achieve steady state. Recognizing the large number of critical B&B assets that require replacement and the significant cost of replacing those assets, the approach defined below includes both useful life benchmark replacement cycles as well as specific strategies for the replacement of critical assets.

Consistent with other asset classes, there are four key elements to the revised B&B lifecycle management strategy, namely:

Achieve SOGR	The primary objective of this strategy is to bring the B&B assets to a state of good repair and then maintain them in a steady state to ensure sufficient capability to meet operational needs.
Prevent Insidious Decline	While Amtrak progresses towards SOGR, introduction of an enhanced assessment regime will guard against the insidious decline in the condition of any individual elements of a structure and ensure that the asset remains in a safe operational state.
Maintain Performance	The implementation of the strategy is through a program that is prioritized to ensure that the B&B infrastructure is able to function in its required state, thus minimizing performance loss due to asset faults and failures.
Support Network Capability Improvement	The program is also designed to ensure that B&B assets contribute to capability targets established through the Amtrak Service Plans, including enabling higher speed operations.

Transition Strategy

The approach taken has been to establish useful life benchmarks (ULBs) to define a program of steady state or normalized maintenance necessary to achieve SOGR. Useful life benchmarks have been established through several sources, including:

- Previous SOGR reports and studies conducted in the last 5 to 10 years
- Engineering review and judgement of typical lifecycle of assets on Amtrak property
- Independent review by outside parties
- International benchmarking against comparable rail networks including those in the United Kingdom and Europe

The concept of a useful life benchmark supports the development of a work-bank, but in itself is not an asset management strategy. This is because the transition to steady state maintenance requires backlog needs to be addressed first. For B&B, it is also essential that asset configuration is considered as part of this strategy. As we move to a steady state replacement cycle, the first iteration needs to be staged (prioritized) such that the ongoing work program is manageable year over year. Table 40 summarizes the proposed replacement cycles and implementation strategies based on our initial review. This will be further reviewed and updated through the plan period.

Table 40: IALP2019 Bridges and Buildings Lifecycle Management Strategy

Activity	Lifecycle strategy / benefit	Implementation strategy
Inspection/ Monitoring		
General	→ To prevent insidious decline of B&B assets, continue to perform inspection and monitoring activities based on Amtrak standards.	→ No significant change to current practice.
Preventive Maintenance		
General	→ To prevent insidious decline of B&B assets, continue to perform preventive maintenance activities based on Amtrak standards.	→ No significant change to current practice.
Corrective Maintenance		
General	→ To prevent insidious decline of B&B assets, continue to perform corrective maintenance activities based on Amtrak standards.	→ No significant change to current practice.
Capital Maintenance		
Steel bridge painting	→ To prevent insidious decline of B&B assets, painting of steel bridges every 50 years.	→ A program of steel bridge painting will be developed through this AMP period (2018-2022).
Capital Replacement		
Movable bridges	→ To return movable bridges to a SOGR and improve network performance, a separate strategy has been developed for each bridge. For long-range planning purposes the expected design life of movable bridges is 150 years.	
Signal bridges	→ To return signal bridges to a SOGR, a separate strategy is being developed for each asset. For long-range planning purposes the expected design life of movable bridges is 80 years.	
Bridge ties	→ To maintain SOGR, replace bridge ties every 24 years.	→ A program of bridge tie replacement will be developed through this AMP period (2020-2024).
Undergrade – fixed bridges	→ To return undergrade fixed-bridges to a SOGR and improve network performance, a separate strategy has been developed for each bridge. For long-range planning purposes the expected design life of undergrade bridges is 150 years.	
Culvert	→ To maintain SOGR, replace culverts every 80 years.	→ A program of culvert replacement will be developed through this AMP period (2020-2024).
Tunnel renewal	→ To return tunnels to a SOGR and improve network performance, a separate strategy has been developed for each tunnel. For long-range planning purposes the expected design life of tunnels is 150 years.	

Retaining wall	→ To maintain SOGR, replace retaining walls every 80 years.	→ A program of retaining wall replacement will be developed through this AMP period (2020-2024).
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Capital Improvement

The Northeast Corridor is one of the most complex and heavily-used railroads in the world. Much of the corridor is not only in need of urgent rehabilitation, but is also approaching the limits of its capacity. Addressing the SOGR backlog therefore provides an opportunity to address these network performance needs and ensure that the NEC corridor can continue to provide safe, reliable, and convenient high-speed rail service into the next century and beyond. A series of network performance improvement projects have been identified which could be advanced within the next five years should funding become available. These projects represent an opportunity to improve network performance while addressing needed SOGR backlog. The costs should therefore be considered in addition to the SOGR backlog identified previously.

Baltimore and Potomac Tunnel Replacement	→ Replacement of B&P tunnel with a new four track tunnel and an improved alignment would both improve reliability and accommodate demand for future train service.
Susquehanna River Bridge Replacement	→ Replacement of Susquehanna River Bridge with two parallel two-track fixed bridges each high enough to allow boats to pass without opening.
East River Tunnel Rehabilitation	→ Rehabilitation of all four tunnels.
Pelham Bay Bridge Replacement	→ Replacement with a new high level fixed bridge with clearance for marine traffic.
Connecticut River Bridge Replacement	→ Replacement with a new movable bridge.
Sawtooth Bridge	→ Replacement of Sawtooth Bridge a four track structure, increasing efficiency and network operations.
Portal North Bridge	→ Replacement of Portal Bridge with a new high-level, fixed span bridge that would eliminate future malfunctions.
Hudson Tunnel Project	→ Construction of a new two track tunnel (Hudson Tunnel), to allow for the existing North River Tunnel to be closed for reconstruction.

Additional Funding Needs

The estimated unconstrained steady state program has been derived from our lifecycle management strategies. The SOGR backlog has been determined based on asset conditions and establishes the transition to a steady state program. A comparison against the FY2019-FY2024 capital program shows a total shortfall of \$14.4 billion over the six-year period.

Overview

Pursuant to 49 U.S.C § 24320(a)(2), the funding needs for B&B assets in excess of amounts authorized or otherwise available to Amtrak is described in this section. The following is covered:

- Amtrak's FY2019 to FY2024 capital program provides the next six years fiscally constrained or budgeted work bank (this is included in full in the main-body of the document).
- An SOGR program, based on the assessed condition of the assets, as noted in the B&B Asset Condition section above. The purpose of this is to identify specific asset priorities and to begin developing a work plan for transitioning to a steady state program.
- A steady state program, based on the useful life benchmarks identified in the B&B Asset Strategy section above. The purpose of this program is to establish the level of normalized renewals necessary to maintain the infrastructure in a SOGR. This assessment neither considers the current condition of the asset nor addresses the backlog, but does provide an indicator of whether funding levels are adequate.

FY2019 to FY2024 B&B Capital Program

Table 41 provides a summary of the FY2019 to FY2024 capital investment plan for B&B assets by route/ownership. Further information is included in the [Work Plan and Budget Forecast section](#) of the main-body of this document.

Table 41: Total Asset Class Funding - FY2019 to FY2024 B&B Capital Program - Summary by Route/Ownership (in \$)

Route	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Amtrak Owned						
NEC Main Line	55,638,000	73,256,847	105,600,000	156,300,000	181,800,000	710,800,000
NEC Branch Line	9,450,000	14,500,000	6,500,000	6,500,000	6,500,000	6,500,000
National Network	17,550,000	16,800,000	5,300,000	4,800,000	4,800,000	4,800,000
Maintained and Operated by Amtrak, Owned by Others						
Owned by CSX and funded by State of NY	5,000,000	4,000,000	250,000	250,000	250,000	250,000
Owned by the State of Michigan	-	-	-	-	-	-
B&B Capital Program – sub-total	87,638,000	108,556,847	117,650,000	167,850,000	193,350,000	722,350,000
TOTAL						1,397,394,847

Forecast Funding Need to Address SOGR Backlog

Based on the 2018 assessed condition of the B&B asset inventory (see B&B Asset Condition above), the SOGR Backlog for B&B assets is estimated to be **over \$21.3 billion in 2018 dollars**.

Given the advancing age of the bridges and buildings assets and historical underinvestment, Amtrak Engineering determined the need for a **10-year SOGR backlog reduction program**. Without a commitment to address the \$21.3 billion backlog we will face serious operational constraints in the years ahead as the right-of-way structured will reach the end of their useful life, potentially resulting in degradation of service reliability and significant reduction of capacity. The required investment need over the planning period to address SOGR is set out in Table 42. This highlights a \$11.6 billion shortfall against forecast expenditure allocated to address SOGR backlog, non-re-occurring projects and significant projects. We will continue to develop our approaches to identifying backlog and our strategies for addressing SOGR in forthcoming plans.

Table 42: Estimated SOGR Backlog Reduction (10-year Program) - Summary by Route

Route	Total SOGR Backlog	Estimated Annual Cost	2019-2024 Total Investment Need
Amtrak Owned			
NEC Main Line	\$ 14,721,008,937	\$ 1,472,100,894	\$ 8,832,605,362
NEC Branch Line (Amtrak owned)	\$ 3,204,461,955	\$ 320,446,195	\$ 1,922,677,173
National Network (Amtrak owned)	\$ 1,308,104,249	\$ 130,810,425	\$ 784,862,549
Maintained and Operated by Amtrak, Owned by Others			
NEC Branch Line (Owned by CSX and funded by State of NY)	\$ 675,700,000	\$ 67,570,000	\$ 405,420,000
National Network (Owned by the State of Michigan)	\$ 1,465,991,809	\$ 146,599,181	\$ 879,565,085
Amtrak B&B SOGR Backlog 10-Year Program	\$21,375,266,950 Total	\$2,137,526,695 Per annum	\$12,825,160,169 Per Plan Period

Forecast Steady State Funding Need

Table 43 below outlines the estimated normalized or steady state program based on the B&B asset strategy and provides an indicator of whether current funding levels are adequate. It should be noted that this represents an unconstrained work bank and establishes the level of normalized renewals necessary to maintain the infrastructure in a state of good repair. It therefore assumes that SOGR backlog is being addressed outside of the funding identified below. For comparison purposes, we have shown the Steady State Investment against the TOTAL FY2019 to FY2024 capital investment plan. It should be noted that the FY2019 to FY2024 plan includes projects to address NEC improvements and SOGR backlog. There is therefore a \$2.8 billion shortfall against forecast expenditure allocated to steady state over the plan period.

Table 43: Estimated Steady State Program and Comparison to Current Plan - Summary by Route/Ownership

Route	Normalized or Steady State Annual Investment Need	Total Req'd Steady State Investment over plan 2019 -2024	TOTAL 2019-2024 Capital Investment Estimate
Amtrak Owned			
NEC Main Line	\$ 333,576,609	\$ 2,001,459,655	\$ 1,283,394,847
NEC Branch Line	\$ 90,687,477	\$ 554,124,864	\$ 49,950,000
National Network	\$ 34,854,145	\$ 209,124,870	\$ 54,050,000
Maintained and Operated by Amtrak, Owned by Others			
NEC Branch Line (Owned by CSX and funded by State of New York)	\$ 14,338,000	\$ 86,028,000	\$ 10,000,000
National Network (Owned by the State of Michigan)	\$ 28,152,661	\$ 168,915,967	\$ -
Amtrak Track Steady State Program	\$ 501,608,893	\$ 3,009,653,357	\$ 1,397,394,847 Total of which \$176,350,000 for SS

Further detail on the estimated required steady state production units compared to the average annual production rate is provided in Table 44.

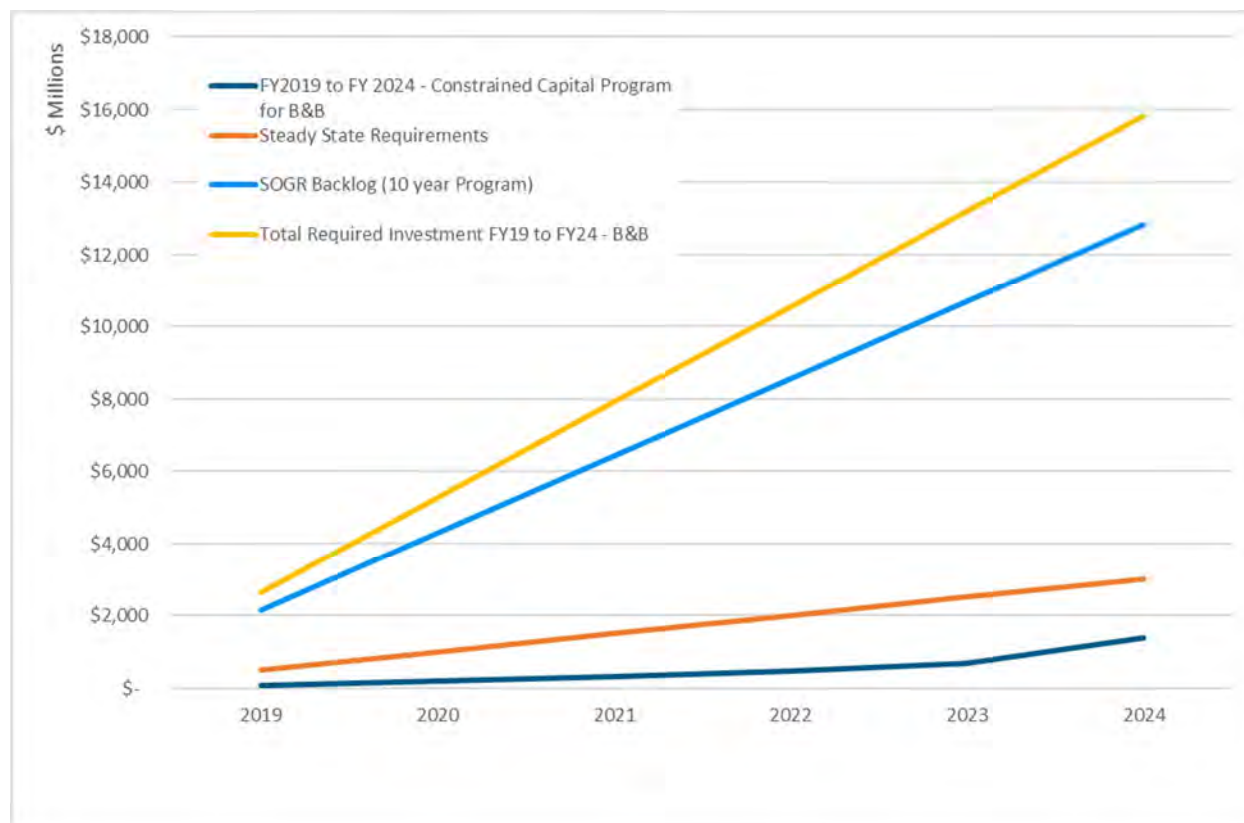
Table 44: Comparison of Estimated Steady State to FY 2019

Activity	Asset Count (EA.)	Useful Life	Steady State	FY 2019	FY 2020	FY 2021	FY 2022**	FY 2023**	FY 2024**
Undergrade Bridge	1,297	100	\$259,400,000	\$6.0M	\$14.0M	\$19.0M	\$39.0M	\$114.0M	\$124.0M
Culvert	930	80	\$11,625,000	\$3.3M	\$3.55M	\$3.55M	\$3.55M	\$3.55M	\$3.55M
Bridge Ties	26,769	20	\$2,944,590	4,200	4,000	2,600	2,600	2,600	2,600
Tunnel	103,214 Lin. Ft.	150	\$68,809,333	\$3.9M	\$4.5M	\$4.5M	\$4.5M	\$4.5M	\$4.5M

Comparison of Capital Plan, with SOGR Backlog and Estimated Steady State Need

The following figure presents a comparison of the budgeted capital program against normalized steady state level of investment and the level of investment needed to begin addressing the SOGR backlog. This analysis highlights a total of **\$14.4 billion** shortfall across the planning period.

Figure 27: B&B - Comparison of FY2019-2024 Constrained Capital Plan, with Estimated Steady State Replacement and Forecast SOGR Program



B&B Strategic Initiatives – Network Improvement Program

Table 79 in [Appendix I](#) of the report (summarized below in Table 46) provides a list of priority projects which could be advanced within the next five years should funding become available. The projects identified are consistent with those published recently by the NEC Commission in its Capital Investment Plan¹¹. As noted previously, these projects represent an opportunity to improve network performance while addressing needed SOGR backlog. The costs should therefore be considered in addition to the SOGR backlog identified previously.

Table 45: Network Improvement Needs and Priorities

Project Definition	SOGR Backlog identified for asset	Forecast Project Cost	FY2019 to FY2024 Funding Requirement	Total Additional Project Funding Required (less SOGR)
Baltimore and Potomac Tunnel Replacement	\$700M	\$4,520M	\$555M	\$3,820M
Susquehanna River Bridge Replacement	\$40M	\$1,700M	\$675M	\$1,660M
East River Tunnel Rehabilitation (see note 1)	\$5,017M	\$750M	\$497M	\$-4,267M
Pelham Bay Bridge Replacement	\$20M	\$410M	\$170M	\$3,900M
Connecticut River Bridge Replacement	\$20M	\$660M	\$414M	\$6,400M
Sawtooth Bridge (part of Gateway Program)	\$30M	\$1,300M	\$1,254M	\$1,270M
Portal North Bridge (part of Gateway Program)	\$20M	\$1,700M	\$1,298M	\$1,680M
Hudson Tunnel Project (part of Gateway Program)	\$2,699M	\$10,000M	\$7,380M	\$7,301M
Total Forecast NEC Network Improvements (unfunded)	\$8,545M	\$21,040M	\$12,243M	\$1,248M

Note 1: The improvement program is for the rehabilitation of the East River Tunnel. Due to the age of the asset, the SOGR backlog identifies this asset for complete replacement.

¹¹ Northeast Corridor Capital Investment Plan – Fiscal Years 2019-2023. Northeast Corridor Commission, August 2018.

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Appendix D: Electric Traction Asset Strategy

Appendix D provides additional information on Amtrak's Electric Traction (ET) assets and establishes the lifecycle management strategy to achieve a state of good repair (SOGR).

Overview

Pursuant to 49 U.S.C § 24320(a)(2), this appendix captures the unconstrained funding needs to adopt a normalized or steady state management strategy necessary to achieve a SOGR. It represents our latest thinking at the time of publication of what work needs to be accomplished based on the proposed use of the asset and its current condition.

The appendix is structured to be consistent with the main body of the IALP2019 with the following sections:

- [Asset Inventory](#) – provides further details on the ET infrastructure assets across all parts of the Northeast Corridor.
- [Asset Condition](#) – presents our current understanding of ET asset condition and our plans for improving our knowledge of the state of the asset.
- [Risk Management](#) – presents the asset and asset management risks and issues related to ET infrastructure.
- [Asset Strategy](#) – presents the lifecycle strategies for the management of ET infrastructure and our strategy for moving towards steady state replacement of the infrastructure.
- [Additional Funding Needs](#) – provides an assessment of the unconstrained steady state program and the forecast SOGR work bank necessary to bring the ET infrastructure assets into SOGR.

Responsible Official

Pursuant to 49 U.S.C. § 24320(c)(3)(c) the following individual is responsible for ET infrastructure owned or managed by Amtrak:

- Eric Hornung, Deputy Chief Engineer Electric Traction

ET Asset Inventory

Amtrak manages ET assets valued at \$6.3 billion – consisting of two traction power systems providing power to electric locomotive trains on the Northeast Corridor.

Inventory Development

Amtrak acknowledge that the asset registry for ET assets is lacking some data attributes. The focus to date has been to ensure safety critical assets are included. As part of an ongoing program of improvement the following issues will be addressed:

- [Asset records](#) – further develop the asset requirements for asset information, identifying the data attributes and defining data parameters.
- [Asset surveys](#) – undertake extensive system wide asset surveys to improve the quality of asset information.

NEC Main Line

Amtrak operates two traction systems along the Northeast Corridor, namely:

- A 25 Hz traction power system along the southern portion of the NEC – commonly referred to as southend electrification.
- A 60 Hz traction power system along the northern portion of the NEC – commonly referred to as northend electrification.

Southend Electrification

The 25Hz southern portion runs 235 route miles between Washington D.C. and Bowery Bay, New York. The system was constructed between 1926 and 1931 and consists of catenary structures carrying static wires, transmission wires operating at 138KV, signal power wires and up to six overhead contact systems operating at 12KV. The overhead contact system consists of fixed termination wires where changes in air temperature cause tensions in the wires to fluctuate limiting the system's ability to provide dependable high-speed service above speeds of 125mph through the regions average low to high temperature range.

Electric power originates at six converter stations which includes one located at the Safe Harbor hydroelectric plant along the Susquehanna River in Pennsylvania. The overall power capacity of the power system is 404MW with a peak load up to 220MW.

A critical element to operational stability introduced during the 92-year evolution of the southend electrification is the built-in redundancy of critical power infrastructure. Major transportation hubs such as Penn Station in New York are supplied power through two sources which ensures undisturbed service in the event one source should fail. The delivery of power through these redundant sources are provided through underground and aerial transmission lines. A risk to these assets has been realized due to the Government's decision to split ownership of property across passenger and freight organizations. Power infrastructure affected by this split that remains critical to the built-in redundancy envisaged by its design falls in most cases within property not owned or maintained by Amtrak – for example power transmission serving Penn Station in New York is transmitted along the Passaic and Harismus (P&H) line infrastructure owned and managed by Conrail.

The southend portion also includes 13.5 miles of 60 Hz catenary on the Hellgate Line between Bowery Bay and New Rochelle, New York. This system is similar to the northend electrification.



Northend Electrification

The northern portion runs 155 route miles between New Haven, Connecticut and Boston, Massachusetts. The system was commissioned in 2000 and consists of catenary structures carrying static wires, negative feeders and an overhead contact system. The overhead contact system consists of a constant tension catenary and contact wire where weights are employed at the ends of the wires to maintain a constant tension through a specified temperature range. This type of system was designed to provide reliable high-speed service above speeds of 125 mph through this modern constant tension technology. The power system employs an autotransformer power delivery system where a transmission system similar to the southern corridor is not required to maintain optimum operating voltage between feeding substations. These feeding substations are fed by local utilities throughout the region and step the utility voltages down for railroad use.

A summary of traction power infrastructure on the Northeast Corridor main line is shown below.

Table 46: NEC Main Line Electric Traction Assets

Asset Type	Count	Unit	Av. Age	Source Notes
Southend Electrification (25Hz)				
Substations				
Support Equipment	47	Substation	1932	Based on the substation count
Circuit Breakers	842	Units	1984	2018 asset inventory - includes: Air, Gas, Oil, and Vacuum
Frequency Convertors	14	Units	1999	Updated – based on DCE provided information
Switches	3,263	Units	1957	2017 AMP (Master Asset List)
Transformers	166	Units	1974	Updated – based on DCE provided information
Catenary				
Catenary Structures	13,797	Units	1936	2018 asset inventory of Catenary Poles
Catenary	842	Miles	1943	2018 asset inventory, age based on Trolley Circuits
Ancillary Equipment	842	Miles	1943	Using Catenary miles and age as estimate
Movable Catenary	.26	Miles	1935	Updated – based on DCE provided information
Other				
Third Rail	45.7	Miles	1991	2018 asset inventory
Northend Electrification (60Hz)				
Substations				
Support Equipment	25	Substation	2000	Based on the substation count
Circuit Breakers	145	Units	1999	2018 asset inventory - includes: Air, Gas, Oil, and Vacuum
Frequency Convertors	N/A	Units	-	No frequency convertors in northend
Switches	736	Units	1999	2017 AMP (Master Asset List)
Transformers	35	Units	1999	Updated – based on DCE provided information
Catenary				
Catenary Structures	12,014	Units	1999	Updated – based on DCE provided information
Catenary	371	Miles	2000	Updated – based on DCE provided information
Ancillary Equipment	371	Miles	2000	Updated – based on DCE provided information
Movable Catenary	0.18	Miles	2000	Updated – based on DCE provided information
Other				
Third Rail	N/A	Miles		No third rail in northend

NEC Branch Lines

In addition to the main line assets described above, Amtrak also owns and operates 106 route miles of 25 Hz traction power built in 1938 between Philadelphia and Harrisburg, Pennsylvania. Electrical power is drawn from the same six 25 Hz converter stations on the Northeast corridor – where about a third of the power is supplied by Safe Harbor.

A summary of traction power infrastructure on the Northeast Corridor branch line is shown below.

Table 47: NEC Branch Line Electric Traction Assets

Asset Type	Count	Unit	Av. Age	Source Notes
Southend Electrification (25Hz)				
Substations				
Ancillary Equipment	11	Miles	2000	Updated – based on DCE provided information
Circuit Breakers	145	Units	1968	2018 asset inventory - includes: Air, Gas, Oil, and Vacuum
Frequency Convertors	N/A	Units	-	No frequency converters on NEC branch-lines
Switches	572	Units	1954	2017 AMP (Master Asset List)
Transformers	22	Units	1959	Updated – based on DCE provided information
Catenary				
Catenary Structures	4,277	Units	1934	2018 asset inventory of Catenary Poles
Catenary	254	Miles	1937	2018 asset inventory, age based on Trolley Circuits
Ancillary Equipment	254	Miles	1937	Using Catenary miles and age as estimate
Movable Catenary	N/A	Units	-	No movable catenary on NEC branch-lines
Other				
Third Rail	0.6	Miles	2018	2018 asset inventory

National Network

The Amtrak national network is not electrified.

ET Asset Condition

Amtrak's ET Department conduct a program of condition monitoring activities to identify faults, prioritize intervention and ensure safe operation of the railroad. However, it has recognized a need to improve its condition assessment capability to predict the optimal point of replacement.

Overview

Amtrak Engineering currently conducts an extensive condition monitoring (inspection) program of ET infrastructure assets at intervals in line with Amtrak catenary inspection and substation inspection manuals. The current monitoring activities ensure safe operation of the railroad. They are used to identify faults and potential faults which result in prioritized and scheduled maintenance. The following table summarizes the ET monitoring program.

Table 48: Summary of ET Condition Monitoring Activities

Activity	Scope/ Description
Catenary Lines/ structures	
Catenary Maintenance Vehicle (Cat Car) Inspection:	<ul style="list-style-type: none"> → Hands on inspection of the overhead contact system including alignment, tensioning and cable diameter (wear) – every 2 years. → Visual inspection by engineers riding in the car.
Catenary Geometry Car Inspection	→ Catenary geometry car records height, stagger, gradient and cable diameter (wear) and creates a suspected defects list – every quarter.
Visual Inspections	<ul style="list-style-type: none"> → Visual inspection by engineers riding at head of train – mainline weekly. → Visual inspection by engineers walking elsewhere on the network. → Temperature extremes may necessitate daily inspections in accordance with ET inspection manuals.
Substations/ Feeder Stations	
General Inspection (ET-28A/ETS-1)	→ Monthly visual inspection of the general condition of the substation including grounds, fence, buildings, safety devices, structures and the status of critical grounding equipment.
Semi-Annual Inspection (ET-28C/ETS-2 through ETS-7)	→ Visual assessment of general condition as per above, plus further detailed review and operational checks of switches and disconnects, transformers, circuit breakers, switchgear, signal power machines and substation batteries.

ET has previously assessed the condition of some assets on a grading scale – including catenary structures. However, this is not undertaken frequently, nor is it undertaken consistently across the ET network or across all ET assets. The whole network has never been fully assessed. As such there is no information available to support predictive analysis to determine the rate of deterioration of assets and predict future ET infrastructure condition. Without an assessed condition, Amtrak is not able to accurately assess the State of Good Repair (SOGR) of its assets, to inform future investment needs and prioritization. To date the SOGR has been estimated using the age of the asset.

Asset Condition Assessment methodology

Pursuant to 49 U.S.C § 24904(c), Amtrak is required to undertake a “condition assessment of those inventoried assets for which a provider has direct responsibility and to level of detail to monitor and predict performance of assets and inform investment prioritization” (U.S. 49 CFR § 625.25(b)(2)).

In meeting this obligation, Amtrak Engineering has developed an electric traction asset condition assessment guide¹² and plans for its implementation are progressing. The guide assesses a series of condition factors, each graded between zero (asset is non-operable) through five (asset is new or nearly new). The approach will result in a condition index for each asset and will enable assessment of SOGR.

Amtrak Engineering consider an asset to be in SOGR when it is in a condition where it can continue to meet and perform the functional requirements for which it was designed to do and when the lifecycle investment needs of the asset have been met. This definition is consistent with the definition laid out in U.S. 49 CFR § 625. Amtrak Engineering grades an asset in SOGR if it scores 2.5 on its updated condition assessment framework, described above.

For IALP2019, the age of the asset is being used to estimate the assets SOGR, based on the remaining useful life of the asset. This will be updated through 2019 and 2020 with visual and measured assessments.

¹² Infrastructure Asset Condition Guidelines – Electric Traction. Version 2, Issued October 2018.

IALP 2019 – Assessed ET Asset Condition

For IALP2019, the assessed condition of ET assets is summarized in the Table 49 below.

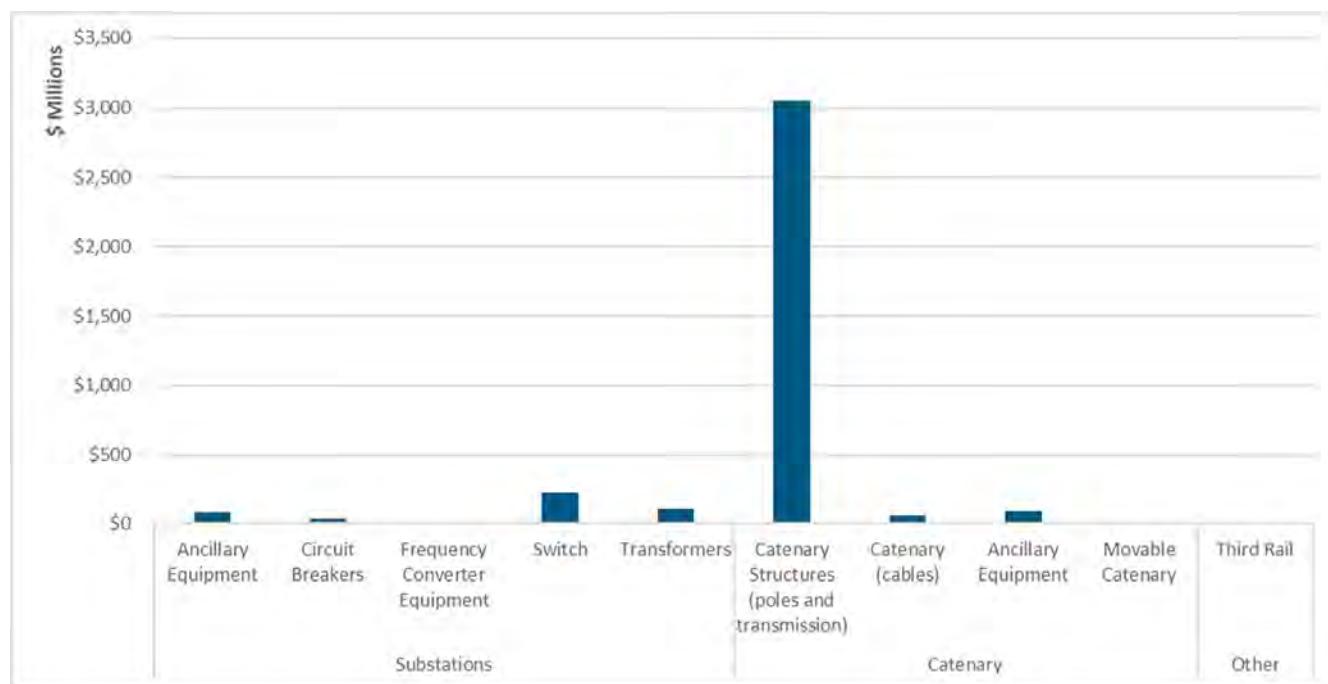
Table 49: 2019 Assessed Condition of ET assets - based on useful life of assets

	NEC Main Line		NEC Branch Line	
Asset Type	Average SOGR	% Not in SOGR	Average SOGR	% Not in SOGR
Southend Electrification (25 Hz)				
Substations				
Ancillary Equipment	1.0	100%	4.0	0.0%
Circuit Breakers	3.0	34%	2.6	54%
Frequency Convertors	3.6	0%	N/A	N/A
Switches	2.0	71%	1.7	81%
Transformers	1.0	100%	1.0	100%
Catenary				
Catenary Structures	1.0	99%	1.0	99%
Catenary	1.0	100%	1.0	100%
Ancillary Equipment	1.0	100%	1.0	100%
Movable Catenary	N/A	N/A	N/A	N/A
Other				
Third Rail	3.0	0%	5.0	0%
Northend Electrification (60 Hz)				
Substations				
Ancillary Equipment	4.0	0.0%		
Circuit Breakers	4.0	0.0%		
Frequency Convertors	N/A	N/A		
Switches	4.0	0.0%		
Transformers	4.0	0.0%		
Catenary				
Catenary Structures	4.0	0.0%		
Catenary	3.0	0.0%		
Ancillary Equipment	3.0	0.0%		
Movable Catenary	1.0	100%		
Other				
Third Rail	N/A	N/A		

The replacement value of ET assets with a condition rating below 2.5, which are assessed as nearing the end of their useful life, is estimated to be **over \$3.6 billion in 2018 dollars**. This is Amtrak's SOGR Backlog for ET assets. Over \$2.8 billion of the backlog is on the NEC main-line with \$816 million on the NEC branch-lines. The largest portion of the backlog is the catenary structures which accounts for over \$3billion.

Figure 28 presents the backlog by ET asset type.

Figure 28: ET Estimated SOGR Backlog by Asset Type (\$m 2018)



Risk Management

Risk management continues to be introduced through IALP2019 to support decision making, planning and prioritization.

Overview

The FAST Act requires that both asset and asset management risks are captured in such a way to inform investment prioritization and establish implementation strategies.

Currently, risk management occurs across Engineering and is very much focused on maintaining a safe railroad operation. For ET infrastructure assets this is achieved through a comprehensive inspection and condition monitoring program summarized above. This approach ensures that the railroad is maintained to meet minimum safety standards.

Amtrak acknowledges the lack of established risk analysis, evaluation and management processes for managing longer-term and non-safety risks. As part of I-AMP2017, Amtrak conducted a basic risk identification exercise for ET assets and asset management practices. This has been revisited as part of IALP2019.

Amtrak Engineering intends to continue to develop its risk management processes – by establishing a ‘known concerns’ log and by updating and monitoring the risks identified in this asset strategy as part of the annual asset line plan development.

Electric Traction Risk Register

The risk register provided in Table 50 has been captured through consultation with Amtrak ET engineering staff. Risks have been identified and, where possible, management actions established.

Risks are grouped in the categories identified in appendix A. The service objective(s) – from the Asset and Asset Management Performance section impacted by the risk are also noted.

Table 50: Electric Traction – Asset and Asset Management Risk Register

Ref:	Risk description	Risk impacts (service objectives)	Existing/ planned control
Organization risks			
ET001	Insufficient ET resources to provide protection to other disciplines working close to the power assets results in lack of resources to support more preventive maintenance of ET assets and impacts our ability to maintain a reliable asset.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery	→ Planned: Additional coordination to more efficiently use resources → Planned: Review resource needs as part of wider Engineering Department resource study
ET002	Insufficient ET resources dedicated to capital-program work, results in lack of a construction program for ET and impacts the timely delivery of necessary projects.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery	→ Planned: Review production resource needs as part of wider Engineering Department resource study
ET003	Staff attrition results in reduction of qualified and experienced ET resources and impacts our ability to deliver work and support other departments.	1. Provide safe and reliable infrastructure for train services	→ Planned: Review resource needs as part of wider Engineering Department resource study
ET004	Reduction in experienced ET resources results in possible increased safety incidents due to lack of knowledge of the Amtrak ET system and impacts our ability to provide safe and reliable service.	1. Provide safe and reliable infrastructure for train services	→ Planned: Review resource needs as part of wider Engineering Department resource study
ET005	Agreement workforce contracts, which allow represented labor to bid out to work for other disciplines, result in ET losing staff and impacts our ability to provide safe and reliable service.	1. Provide safe and reliable infrastructure for train services	→ Planned: Escalate need for review of Amtrak agreement workforce contracts
Asset management Risks			
ET006	Outdated policies, manuals and procedures results in inconsistent work practices and impacts ET's ability to improve performance and provide a reliable infrastructure. The issue is exacerbated due to staff attrition.	1. Provide safe and reliable infrastructure for train services	→ Planned: Program of updates of policies, manuals and procedures to be introduced in 2018

ET007	Lack of knowledge of underground infrastructure, results in increased construction risk when installing new catenary structures and impacts our ability to deliver infrastructure replacement within established outages.	<ol style="list-style-type: none"> 1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 	<ul style="list-style-type: none"> → Current: Capital program delivery informed by local knowledge → Planned: Additional work to update and improve ET asset data
ET008	Lack of asset information including basic records, as built drawings and condition data results in ineffective decision making and impacts our ability to prepare long-term plans.	<ol style="list-style-type: none"> 1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 	<ul style="list-style-type: none"> → Current: ET capital program informed by local knowledge that drives prioritization for replacement → Planned: Asset registry improvement activities as identified in this plan
ET009	Poor quality and missing ET information results in incomplete capture of cost/work historical data and impacts our ability to forecast maintenance effort needed for assets.	<ol style="list-style-type: none"> 1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery 	<ul style="list-style-type: none"> → Planned: Additional work to update and improve ET asset data

Asset risks

ET010	Failure to generate enough power at Safe Harbor (through either drought, or failure of the aged infrastructure) results in reduced generation capacity and impacts our ability to provide reliable power supply.	<ol style="list-style-type: none"> 1. Provide safe and reliable infrastructure for train services 3. Manage implementation of agreements and adherence to the cost allocation policy 	<ul style="list-style-type: none"> → Current: Continuous review of traction power supply network to ensure adequacy of power generation. → Current: Built in network wide redundancy enables management of short-term issues like drought. In the advance of a drought, Amtrak accelerate other maintenance programs to ensure reliability of power supply. → Planned: Review maintenance schedules and asset management plans with utilities to confirm adequate power supply reliability
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ET011	Failure of the utility companies to maintain their infrastructure results in reduced power provision to Amtrak infrastructure and impacts our ability to provide reliable service.	1. Provide safe and reliable infrastructure for train services 3. Manage implementation of agreements and adherence to the cost allocation policy	→ Current: Continuous review of traction power supply network to ensure adequacy of power generation. → Planned: Review maintenance schedules and asset management plans with utilities to confirm adequate power supply reliability
ET012	Lack of vegetation management across the network and particularly in those areas off-corridor results in asset failures and impacts our ability to provide reliable service.	1. Provide safe and reliable infrastructure for train services	→ Planned: Program of vegetation management to be established in FY2019
ET013	Off-corridor transmission assets (P&H branch for example) results in potential damage from encroachment that is not stopped, and it impacts our access to carry out maintenance and our ability to deliver safe and reliable train services.	1. Provide safe and Reliable Infrastructure for Train Services 5. Improve Network Performance	→ Current: No current control. Off-property assets are not monitored by Amtrak staff. → Planned: Introduce site specific study to identify immediate remedial actions. Introduce a regular program of monitoring
ET014	High value – accessible assets (particularly those which are less frequently monitored) results in an increased risk of theft/ vandalism and impacts our ability to provide reliable service.	1. Provide safe and reliable infrastructure for train services 3. Manage implementation of agreements and adherence to the cost allocation policy	→ Planned: Review whether increased signage, security, surveillance, would act as a deterrent and consider installing intrusion detection systems
ET015	Asset exposure to chemical pollutants from refineries and other manufacturing facilities (for example in New Jersey) results in a more rapidly deteriorating asset and impacts our ability to efficiently provide reliable infrastructure.	1. Provide safe and reliable infrastructure for train services 3. Manage implementation of agreements and adherence to the cost allocation policy	→ Current: Inspections identify highest risk assets, which are included in the capital program → Planned: Introduction of a condition assessment program in FY2019 will enable Amtrak to better monitor the rate of deterioration

ET016	A history of underinvestment in ET assets results in a substantial SOGR backlog of urgent capital investment and impacts our ability to improve the infrastructure to improve network performance.	<ol style="list-style-type: none"> 1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 3. Manage implementation of agreements and adherence to the cost allocation policy 5. Improve Network Performance 	<ul style="list-style-type: none"> → Current: Inspections identify highest risk assets, which are included in the capital program. Focus of the current FY2019-FY2024 capital plan is to address SOGR issues. → Planned: Introduction of a condition assessment program in FY2019 will enable Amtrak to better monitor the rate of deterioration and justify additional funding to address the backlog
ET017	The age of ET assets introduces obsolescence risk as certain components are no longer supported, which results in assets with poor maintainability and impacts service performance and recovery of service.	<ol style="list-style-type: none"> 1. Provide safe and reliable infrastructure for train services 	<ul style="list-style-type: none"> → Current: Holding stock of critical spares → Planned: Replace un-supported assets as part of planned capital program
ET018	Localized flooding risk results in potential asset failures and impacts reliability and ability to quickly recover service.	<ol style="list-style-type: none"> 1. Provide safe and reliable infrastructure for train services 	<ul style="list-style-type: none"> → Planned: Identify locations prone to flooding and consider asset resiliency improvements based on risk
ET019	Third party utilities being carried on Amtrak catenary structures results in increased track access requirements (for third parties to assess their infrastructure, and impacts the time available for Amtrak access and available ET resources.	<ol style="list-style-type: none"> 1. Provide safe and reliable infrastructure for train services 4. Improve Planning and Project Delivery 	<ul style="list-style-type: none"> → No actions proposed
ET020	Third party utilities being carried on Amtrak catenary structures results in increased effort to replace structures (requiring additional planning effort with third parties and additional construction coordination)	<ol style="list-style-type: none"> 4. Improve Planning and Project Delivery 5. Improve Network Performance 	<ul style="list-style-type: none"> → No actions proposed

ET Asset Strategy

Lifecycle Management Strategies developed as part of I-AMP2017 capture the normalized or steady state activities necessary to achieve a steady state of good repair and ensure ET assets are functional and able to continue to support a safe, efficient and sustainable national rail network.

Overview

The current ET lifecycle management approach is largely reactive, determined by engineering judgement and focused on maintaining safety. ET undertakes flow studies to predict and plan the construction of new power systems. However, there is currently no approach in place for predicting and prioritizing future investment needed in existing assets based on the condition, or assessment of likely future performance. This is partially driven by the bigger question and challenge for how to modernize the existing infrastructure – a program which would have significant impact on service.

ET has no FRA mandated inspections but do undertake a number of inspections as described in the 'Asset Condition' section above. Maintenance strategies are defined in procedure manuals, which ET recognize are outdated, and an effort to update these has been initiated.

ET acknowledge that preventive maintenance activities are not consistently completed due to limited resource availability and a need to provide ET staff to support other asset classes (for isolation) or capital projects. This has resulted in a growing maintenance backlog, which is becoming a major priority.

Further, capital replacement strategies are not well-defined. To date, the limited information to support long-term decisions and the issues with available resources result in a program focused on replacing high risk assets only. ET acknowledges that there are competing demands for staff for capital improvement projects (for example high speed rail) and capital replacement projects to improve reliability.

In I-AMP2017, Amtrak Engineering commenced a review of the lifecycle strategies for all infrastructure assets. Its purpose was to develop the long-term infrastructure maintenance and improvement program to reach a state of good repair. For ET this represented the start of developing a network wide view of the capital investment needed for electric traction infrastructure to meet current and future demands. In particular, this strategic review considered implementation of more reliable catenary wires for higher speed operations (moving from fixed to constant tension cables), decreasing risks associated with transmission on some parts of the network, and replacement of at-risk structures.

The lifecycle management strategies for ET assets, laid out in the following sections, define the approach adopted for the 2019 program and the revised approach for the years following to address backlog and approach steady state for state of good repair and maintenance spend.

It is recognized that the overall strategy needs further work – particularly related to changes in asset configuration to improve performance and reliability. This work will, therefore, continue through the planning period.

Current Asset Strategies

The current lifecycle management strategies employed by Amtrak to achieve its ET asset objectives are described in Table 51. Few assets have lifecycle strategies developed, and the run-to-fail approach is generally used. Engineering judgement has been used to determine the work bank for 2019 and beyond.

The aim of the ET Department is to maintain and improve the condition of the ET infrastructure to minimize safety risks and train service impacts. Work is categorized into the following:

- **Inspection/monitoring** activities to confirm the asset is able to function in its required state and provide a safe operational environment.
- **Preventive maintenance** activities to achieve a required level of asset performance and maintain a safe operational environment.
- **Corrective maintenance** activities to return the asset to its required function and restore a safe operational environment.
- **Capital maintenance** to restore the asset to an operational design standard and maintain performance.
- **Capital replacement** to renew the asset and maintain performance.
- **Capital improvement** to replace the asset and improve performance or network capability.

Table 51: Current Lifecycle Management Strategies

Category	Description
Catenary Lines/ Structures	
Inspection/ Monitoring	<ul style="list-style-type: none"> → Automated inspections by catenary car and track geometry car. → Visual inspections by engineers in rail car and on foot.
Preventive Maintenance	<ul style="list-style-type: none"> → Corrosion treatment and painting of catenary structures (limited use due to resource constraints).
Capital Replacement	<ul style="list-style-type: none"> → Corrective maintenance of failed components treated as capital replacement. → Limited replacement of catenary structures – based on failed or high risk of failure. → Limited replacement of catenary/transmission lines – based on failed or high risk of failure. Cat wire replacement is based on wear measurements from TGC and Cat inspection car.
Capital Improvement	<ul style="list-style-type: none"> → Limited modernization of overhead catenary wires to constant tension along a 14-mile section of track between Trenton and New Brunswick, New Jersey to accommodate operating at speeds up to 160 mph and increase reliability.
Substations/ Feeder Stations	
Inspection/ Monitoring	<ul style="list-style-type: none"> → Monthly visual safety inspection. → Visual assessment of all asset conditions.
Preventive Maintenance	<ul style="list-style-type: none"> → Preventive maintenance programs require revisiting. Currently, not consistently applied. → Little to no maintenance is carried out on off corridor transmission lines.
Capital Replacement	<ul style="list-style-type: none"> → Focused on transformers, breakers and switches – to reduce risk of failure. → Transmission lines – replacement of insulators on an as needed basis.
Capital Improvement	<ul style="list-style-type: none"> → No improvement strategies.

Moving Towards Normalized or Steady State Maintenance

As reported in I-AMP2017, there are four key elements to the ET lifecycle management strategy, namely:

Achieve SOGR	The primary objective of this strategy is to bring the ET assets to a state of good repair and then maintain them in a steady state to ensure sufficient capability to meet operational needs.
Prevent Insidious Decline	While Amtrak progresses towards SOGR, introduction of an enhanced assessment regime will guard against the insidious decline in the condition of any individual sections of electric traction network and ensure that the asset remains in a safe operational state.
Maintain Performance	The implementation of the strategy is through a program that is prioritized to ensure that the ET infrastructure is able to function in its required state, thus minimizing performance loss due to asset faults and failures.
Support Network Capability Improvement	The program is also designed to ensure that ET assets contribute to capability targets established through the Amtrak Service Plans, including enabling higher speed operations.

Transition Strategy

The approach taken has been to establish useful life benchmarks (ULBs) to define a program of steady state or normalized maintenance necessary to maintain SOGR. Useful life benchmarks have been established through several sources, including:

- Previous SOGR reports and studies conducted in the last 5 to 10 years
- Engineering review and judgement of typical lifecycle of assets on Amtrak property
- Independent review by outside parties
- International benchmarking against comparable rail networks including those in the United Kingdom and Europe

The concept of a useful life benchmark supports the development of a required work bank, but it is not an asset management strategy. This is because the transition to steady state maintenance requires backlog needs to be addressed first. Further, as we move to a steady state replacement cycle, the first iteration needs to be staged (prioritized) such that the ongoing work program is manageable year over year. Table 52 summarizes the proposed replacement cycles and implementation strategies. As highlighted in the main-body of this document the transition strategy also needs to consider:

- **Track access** – current outage availability restricts efficient project delivery. This will need to be reviewed to economically address the backlog.
- **Labor resources** – currently production workforces are only available for track capital work. The New Jersey High Speed project demonstrated the value in re-thinking how we tackle projects and considering production workforces for other asset classes.
- **Equipment** – current equipment capacity is insufficient. This is addressed in [Appendix F](#).
- **Funding** – the backlog identified is significant – a robust and consistent funding stream needs to be established.

Table 52: IALP2017 ET Lifecycle Management Strategy

Activity	Lifecycle strategy / benefit	Implementation strategy
Inspection/ Monitoring		
General	→ To ensure safe ET operations and prevent insidious decline, introduction of a general condition assessment of all ET infrastructure assets to support predictive analysis and investment planning/ prioritization.	→ Condition assessment framework rolled-out through 2019 and 2020.
Preventive Maintenance		
	→ N/A	
Corrective Maintenance		
General	→ To ensure safe ET operations and prevent insidious decline, continue to perform corrective maintenance activities on ET assets as required.	→ No significant change to current practice.
Capital Replacement - Distribution		
Catenary Structure	→ To maintain reliability and prevent insidious decline, perform a mid-life rehabilitation of the catenary structure every 38 years (estimated to cost 20% of capital replacement cost). → To achieve SOGR, replace catenary structure every 75 years.	→ A program of catenary structure rehabilitation will be developed and introduced through this planning period (2019 to 2024) on a whole life cost justification basis. The program will be informed by the condition assessment being rolled-out through the planning period. → A program of catenary structure replacement is being introduced through this planning period (2019 to 2024). To manage the backlog of renewals, and provide a levelled work program, delivery of the work bank is spread over a 15-year period. This is to allow a production workforce to be established and continually utilized.
Catenary Hardware	→ To achieve SOGR, replace catenary hardware every 30 years.	→ A program of catenary hardware replacement is being introduced through this planning period (2019 to 2024). The program will be scheduled to align with the mid-life rehabilitation of the structure.
Catenary Wire	→ To achieve SOGR and maintain reliability, replace the catenary wire when the wire reaches 25% of the installed cross section (estimated to cost 30% of initial capital cost). For planning, contact wire is estimated to last 30 years.	→ A program of catenary wire replacement is being introduced through this planning period (2019 to 2024). The program will be scheduled to align with the catenary structure/ hardware replacement.

Third Rail	→ To achieve SOGR and maintain reliability, replace third rail every 40 years.	→ A program of third rail replacement is being introduced through this planning period (2019 to 2024). To manage the backlog of renewals, and provide a levelled work program, delivery of the work bank is spread over a 5-year period. This is to allow a production workforce to be established and continually utilized. The replacement of third rail will coincide with the replacement of running rail or ties if either of these expire within six years of the third rail.
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Capital Replacement – Transmission

Transmission Lines	→ To achieve SOGR and maintain reliability, replace transmission lines every 80 years.	→ The program being introduced in 2019 will focus on off-corridor transmission lines which present a high risk. → Replacement of on-corridor lines will coincide with catenary structure replacement.
Underground Cable	→ To achieve SOGR and maintain reliability, replace underground cable every 60 years based on insulation.	→ Replacement of underground cables will be undertaken on a whole life cost justified basis. Cables are expected to last 60 years. A program of cable replacement will be developed following the condition assessment being rolled-out in 2019 and 2020.
Transformers/ Insulators	→ To achieve SOGR and maintain reliability, replace transformers/insulators every 40 years.	→ A program of transformer/insulator replacement will be developed and introduced through this planning period (2019 to 2024) on a whole life cost justification basis. The program will be informed by the condition assessment being rolled-out through 2019 and 2020.
Substations	→ To maintain reliability and prevent insidious decline, perform a mid-life rehabilitation of substations every 20 years (estimated to cost 25% of capital replacement cost). → To achieve SOGR, replace substations every 40 years.	→ A program of substations rehabilitation and replacement will be developed and introduced through this planning period (2019 to 2024) on a whole life cost justification basis. The program will be informed by the condition assessment being rolled-out through 2019 and 2020.

Capital Improvement

Off-Corridor Transmission Line Replacement	→ To maintain reliability and support network capability improvement, replace the off-property transmission lines.	→ Program developed during the planning period (2019 to 2024).
New Jersey High Speed Program	→ To maintain reliability and support network capability improvement, upgrade the catenary and power systems on the NEC primarily between New Brunswick, NJ and Trenton, NJ.	→ Program underway and continuing during the planning period (2019 to 2024).

Additional Funding Needs

The estimated unconstrained steady state program has been derived from our lifecycle management strategies. The SOGR backlog has been determined based on asset conditions and establishes the transition to a steady state program. A comparison against the FY2019-FY2024 capital program shows a shortfall of \$1.98 billion over the six-year period.

Overview

Pursuant to 49 U.S.C § 24320(a)(2), the funding needs for ET assets in excess of amounts authorized or otherwise available to Amtrak is described in this section. The following is covered:

- Amtrak's FY2019 to FY2024 capital program provides the next six years fiscally constrained or budgeted work bank (this is included in full in the main-body of the document).
- An SOGR program, based on the assessed condition of the assets, as noted in the ET Asset Condition section above. The purpose of this is to identify specific asset priorities and to begin developing a work plan for transitioning to a steady state program.
- A steady state program, based on the useful life benchmarks identified in the ET Asset Strategy section above. The purpose of this program is to establish the level of normalized renewals necessary to maintain the infrastructure in a SOGR. This assessment neither considers the current condition of the asset nor addresses the backlog, but it does provide an indicator of whether funding levels are adequate.

FY2019 to FY2024 ET Capital Program

Table 53 provides a summary of the FY2019 to FY2024 capital investment plan for ET assets by route/ownership. Further information is included in the [Work Plan and Budget Forecast section](#) of the main-body of this document.

Table 53: Total Asset Class Funding - FY2019 to FY2024 ET Capital Program - Summary by Route/Ownership (in \$)

Route	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Amtrak Owned						
NEC Main Line	63,942,157	149,232,091	152,808,036	142,062,178	127,821,533	73,685,000
NEC Branch Line	5,950,000	11,549,950	33,445,864	21,716,617	3,300,000	3,300,000
ET Capital Program – sub-total	69,892,157	160,782,041	186,253,900	163,778,795	131,121,533	76,985,000
TOTAL						\$ 788,813,426

Forecast Funding Need to Address SOGR Backlog

Based on the 2018 assessed condition of the ET asset inventory (see ET Asset Condition above), the SOGR Backlog for ET assets is estimated to be **over \$3.6 billion in 2018 dollars**. In 2019 through 2020 we will be implementing a program of condition assessments to further inform our planning and prioritization capability, with future SOGR programs being derived from an improved understanding of asset condition and the deterioration of condition through asset operations.

Given the advancing age of the electric traction assets and historical underinvestment, Amtrak Engineering determined the need for a **10-year SOGR backlog reduction program**. Without a commitment to address the \$3.6 billion backlog we will face serious operational constraints in the years ahead as the electric traction infrastructure will reach the end of its useful life, potentially resulting in degradation of service reliability and significant reduction of capacity. The required investment need over the planning period to address SOGR is set out in Table 54. This highlights a \$1.72 billion shortfall against forecast expenditure allocated to address SOGR backlog, non-re-occurring projects and significant projects. We will continue to develop our approaches to identifying backlog and our strategies for addressing SOGR in forthcoming plans.

Table 54: Estimated SOGR Backlog Reduction (10-year Program) - Summary by Route

Route	Total SOGR Backlog	Estimated Annual Cost	2019-2024 Total Investment Need
Amtrak Owned			
NEC Main Line	\$2,833,924,328	\$ 283,392,433	\$ 1,700,354,598
NEC Branch Line	\$816,426,750	\$ 81,642,675	\$ 489,856,050
Amtrak ET SOGR Backlog 10-Year Program	\$ 3,650,351,078 Total	\$ 365,035,108 Per annum	\$ 2,190,210,648 Per Plan Period

Forecast Steady State Funding Need

Table 55 below outlines the estimated normalized or steady state program based on the ET asset strategy and provides an indicator of whether current funding levels are adequate. It should be noted that this represents an unconstrained work bank and establishes the level of normalized renewals necessary to maintain the infrastructure in a state of good repair. It therefore assumes that SOGR backlog is being addressed outside of the funding identified below. For comparison purposes, we have shown the Steady State Investment against the FY2019 to FY2024 capital investment plan. This highlights a \$260 million shortfall during the planning period.

Table 55: Estimated Steady State Program and Comparison to Current Plan - Summary by Route

Route	Normalized or Steady State Annual Investment Need	Total Req'd Steady State Investment over plan 2019 -2024	Total 2019-2024 Capital Investment Estimate
Amtrak Owned			
NEC Main Line	\$ 84,132,788	\$ 504,796,729	\$ 429,248,168
NEC Branch Line	\$ 13,025,189	\$ 78,151,133	\$ 79,262,431
Amtrak ET Steady State Program	\$ 97,157,977	\$ 582,947,862	\$ 508,510,599 Total of which \$322,869,962 for SS

Further detail on the estimated required steady state production units compared to the average annual production rate is provided in Table 56.

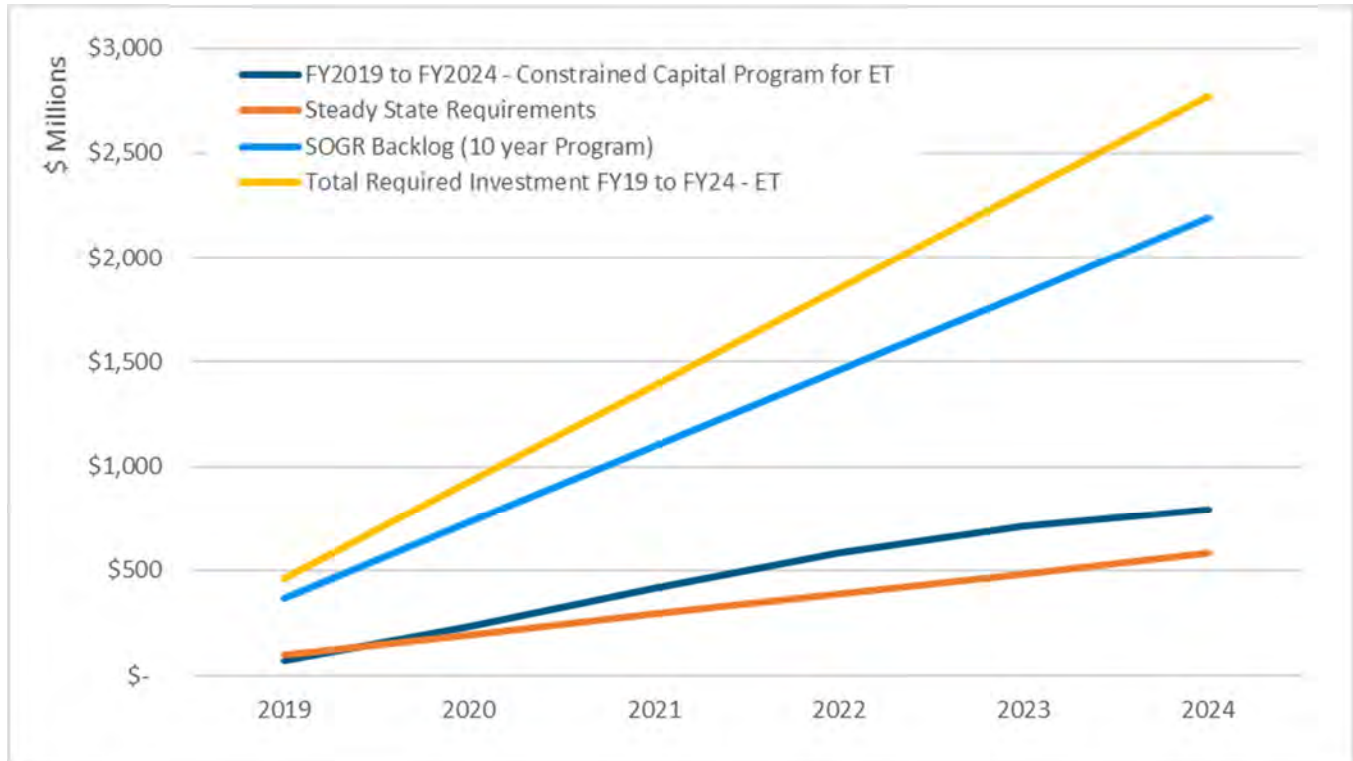
Table 56: Comparison of Estimated Steady State to FY 2019

Asset Component	Asset Count	Useful Life	Steady State	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Catenary & Transmission Structures	30,088	75	401	8	10	3	3	3	3
Catenary Wire	1,467	30	49	26	15	16	14	14	14
Transmission Wire	-	-	-	3	3	3	3	3	3
Substation Power Transformers	1,195	40	30	3	8	10	-	-	-
Substation Circuit Breakers	1,132	40	28	28	26	28	5	-	-
Third Rail (miles)	46.33	40	1	-	-	-	-	-	-
Frequency Converter Units	39	40	1	-	1	-	-	2	-

Comparison of Capital Plan, with SOGR Backlog and Estimated Steady State Need

Figure 29 presents a comparison of the budgeted capital program against normalized steady state level of investment and the level of investment needed to begin addressing the SOGR backlog. This analysis highlights a total \$2.26 billion shortfall across the planning period.

Figure 29: ET - Comparison of FY2019-2024 Constrained Capital Plan, with Estimated Steady State Replacement and Forecast SOGR Program



Appendix E: Communications and Signals Asset Strategy

Appendix E provides additional information on Amtrak's communications and signals (C&S) assets and establishes the lifecycle management strategy to achieve a state of good repair (SOGR).

Overview

Pursuant to 49 U.S.C § 24320(a)(2), this appendix captures the unconstrained funding needs to adopt a normalized or steady state management strategy necessary to achieve a SOGR. It represents our latest thinking at the time of publication of what work needs to be accomplished based on the proposed use of the asset and its current condition.

The appendix is structured to be consistent with the main body of the IALP2019 with the following sections:

- [Asset Inventory](#) – provides further details on the C&S infrastructure assets across all parts of the national network.
- [Asset Condition](#) – presents our current understanding of C&S asset condition and our plans for improving our knowledge of the state of the asset.
- [Risk Management](#) – presents the asset and asset management risks and issues related to C&S infrastructure.
- [Asset Strategy](#) – presents the lifecycle strategies for the management of C&S infrastructure and our strategy for moving towards steady state replacement of the infrastructure.
- [Additional Funding Needs](#) – provides an assessment of the unconstrained steady state program and the forecast SOGR work bank necessary to bring the C&S infrastructure assets into SOGR.

Responsible Official

Pursuant to 49 U.S.C. § 24320(c)(3)(c), the following individual is responsible for Signals infrastructure owned or managed by Amtrak:

- Nicholas Croce, Deputy Chief Engineer Communications and Signals

C&S Asset Inventory

Amtrak's manages C&S assets valued at \$4.88 billion – including signaling equipment that controls train movements through 239 interlockings and 3,294 track circuits nationwide.

Overview

As with other modern rail networks, Amtrak operates a tiered system to enable safe and efficient train movements, making full use of the available track paths, as follows:

- The first tier is **centralized traffic control (CTC)** through which train dispatchers control train movements. Movement is controlled through (1) trackside signals of ABS, which signal the engineer to take needed actions but do not override him or her if no action is taken; and (2) interlockings which consist of signals and appliances that enable safe train movement across tracks.
- The second tier is **Cab Signals**, which duplicate the indications of the trackside signals.
- The third tier is **Automatic Train Control (ATC)**, which automatically slows or stops a train if the engineer fails to comply with speed reductions required by the cab signal. Amtrak has had ATC since it took over operations in 1976.
- The fourth tier is **Positive Train Control (PTC)**. On the NEC, Amtrak's PTC system is known as the Advanced Civil Speed Enforcement System (ACSES). ACSES builds on the protection provided by ATC and can automatically bring a train to a stop at a red signal or slow it on a sharp curve. Amtrak also operate PTC known as the Incremental Train Control System (ITCS) on the Michigan line and the Interoperable Electronic Train Management System (I-ETMS) on the NEC main line for hosted rail users – primarily Norfolk Southern.
- **Radios** – including both locomotive or portable units (limited data available).
- **Network** – fiber loop converters, HDSL equipment units, and other network equipment are not included (limited data available).
- **Telecommunications** – Telephone switching equipment, voicemail systems, equipment houses, cables are not included (limited data available).

Inventory Development

Amtrak Engineering acknowledges that the current asset registry for C&S assets is lacking some data attributes. The focus to date has been to ensure safety critical assets are included. As part of an ongoing program of improvement the following issues will be addressed:

- **Data Gaps** – several gaps exist in the C&S data sets – particularly off-corridor. These will be addressed during the plan period.
- **Communications Data** – there is limited communication asset data available. This will be improved through the plan period.
- **Centralized Traffic Control (CTC)** – asset data is currently lacking. This will be added through the plan period.
- **Interlocking Machines** – will be recorded as signal assets and located against the track interlocking
- **Signal Towers** – inventory will be updated.
- **Age Records** – age information is currently not recorded in Maximo. The effort undertaken as part of I-AMP2017 to estimate age will be loaded into Maximo for future reference.

NEC Main Line (Amtrak Owned) – Signals Assets

Most of the NEC main line signal system has either been replaced or upgraded under various programs starting with the Northeast Corridor Improvement Program (NECIP), which began in the late 1970s and continued through most of the 1980s. Under this program the signal system was replaced from New York Avenue in Washington, DC to Wilmington, DE, between Harold interlocking and New Rochelle in New York, and between Transfer interlocking and Tower 1 interlocking in the Boston area. The NECIP Program also replaced a few interlockings between New York and Philadelphia. Between New York and Washington, DC the air switches and many of the signals were not replaced under the program. The interlockings were relay-based and the track circuits were mostly Phase Selective type circuits. A program was started to replace the air switches with electric switch machines, but there are still many air switches in service.

Since the end of the NECIP program, Amtrak has used its annual capital program and other sources of capital to replace and upgrade the signal system from Wilmington, DE to Penn Station New York. Most of the interlockings on the New York Division have been renewed with relay type interlockings. Until recently, there was one remaining mechanical interlocking machine at Dock interlocking, which was installed in 1929.

All main tracks on the Mid-Atlantic are signaled for bi-directional traffic. On the New York division the outside tracks are mostly signaled for single direction traffic and the inside tracks (tracks 2 & 3) are signaled for bi-directional traffic. There are two exceptions; between Ham interlocking and County interlocking, all tracks are signaled for both directions. This section was recently completely renewed under the High-Speed Rail program. The other exception is between Hudson interlocking and Penn Station New York, which was renewed under the NJT Secaucus project where all tracks are signaled for both directions.

Penn interlocking in Philadelphia was installed in the 1950s and was not renewed under the NECIP program. Penn is an all relay plant with obsolete plug-in relays and other signal apparatus. The switches at Penn are mostly air (a few electric machines were installed to support a track replacement program), and the air plant is in poor condition.

The signal system in New England was upgraded or replaced in the 1990s in support of the electrification program. Most of the interlockings were replaced with vital micro-processor-based equipment and micro-processor-based track circuits were installed from New Haven to Transfer interlocking just outside Boston. The entire route is cab signaled with all tracks signaled for both directions. Between Mill River interlocking and Atwells interlocking in Providence, RI, the automatic wayside signals were removed except for distant signals to interlockings.

There is still one mechanical interlocking machine in service in New York. It is at Q tower in Sunnyside Yard. This interlocking is in very poor condition and in need of replacement. The switch machines are mostly air, and the air plant is in poor condition.

A summary of key Signals infrastructure features on the NEC main line is shown in Table 58 below. In 2018 Massachusetts Bay Transportation Authority (MBTA) took over maintenance and responsibility for all infrastructure it owns along the NEC between Boston and Rhode Island state line, known locally as the Attleboro Line. These assets have been removed from this plan.

Table 57: Summary of Signals Assets - NEC main line – Amtrak Owned

Asset Type	Count	Unit	Av. Install Date	Source Notes
Interlocking				
Wayside Equipment				
Switch Machine	2,025	Units	1991	2018 asset inventory
Switch Heaters	1,217	Units	1997	2018 asset inventory
Signals	1,973	Units	1989	2018 asset inventory
Movable Bridge	10	Units	1934	2018 asset inventory
Instrument Houses				
Instrument Building	1,323	Units	1987	2018 asset inventory
ABS Section				
Wayside Equipment				
Track Circuit Equipment	2,347	Units	1993	2018 asset inventory
ACSES (PTC)	1,676	Miles	2011	2018 asset inventory
Crossing				
Wayside				
Grade Crossing	12	Units	1995	2018 asset inventory

NEC Branch Lines (Amtrak Owned) – Signals Assets

The Harrisburg Line (Philadelphia to Harrisburg, PA) was partially re-signaled under a joint program between Amtrak and the State of Pennsylvania between 2004 and 2007. The project extended from State interlocking (exclusive) in Harrisburg to Park Interlocking near Parkesburg, PA. All the interlockings were replaced with vital micro-processor-based equipment, electric switch machines, new signals and all new cable. The automatic signal territory between interlockings were renewed with vital microprocessor coded track circuits with a dual frequency cab signal system. Wayside signals in the automatic territory were removed except for the distant signals. In 2016, State interlocking was replaced with a vital micro-processor-based system, new electric switch machines, new signals and cable. The rest of the line between Park interlocking and Philadelphia is mostly unimproved and the signal system dates back to the 1930s or 40s or earlier. This unimproved portion is signaled for only one direction on each track. There are 4 interlocking towers at Thorn, Paoli, Overbrook and Zoo that control this portion of the line. These towers have mechanical interlocking machines, which have been obsolete for decades, and have air switch machines, which rely on air plants that are in very poor condition. A few other interlockings are remote controlled from these towers. Some of these were installed in the 1990s, but others are as old or almost as old as the interlocking towers and are in very poor condition.

The Springfield Line was re-signaled in 1990 when the line was converted from double track to single track with passing sidings. The project included installation of cab signals, relay based interlockings and microprocessor-based track circuits in the automatic signal territory. The State of Connecticut obtained a grant to double track the line between Mill River and Hartford. The double track project is not yet complete.

The Empire connection between Penn Station, New York and Metro North's CP12 at Spuyten Duyvil was installed new in 1990-1991 as a single-track line and then upgraded to a double track line in 1992. The interlockings are relay-based, and the track circuits between interlockings are microprocessor-based with cab signals.

A summary of key C&S infrastructure features on the NEC branch lines is shown in Table 58 below.

Table 58: Summary of Signals Assets - NEC Branch Lines – Amtrak Owned

Asset Type	Count	Unit	Av. Install Date	Source Notes
Interlocking				
Wayside Equipment				
Switch Machine	447	Units	1985	2018 asset inventory
Switch Heaters	193	Units	1997	2018 asset inventory
Signals	576	Units	1973	2018 asset inventory
Movable Bridge	2	Units	1902	2018 asset inventory
Instrument Houses				
Instrument Building	455	Units	1982	2018 asset inventory
ABS Section				
Wayside Equipment				
Track Circuit Equipment	648	Units	1988	2018 asset inventory
ACES (PTC)	328	Miles	2011	2018 asset inventory
Crossing				
Wayside				
Grade Crossing	52	Units	1991	2018 asset inventory

State of New York Supported Assets – Signals Assets

In 2012, Amtrak leased the Hudson Line from CSX under an agreement with the State of New York. Between Poughkeepsie and Rensselaer the signal system is mostly a relay based system with cab signals. Line circuits between locations were on pole lines consisting of open wire in some areas and aerial cable in others. Upon taking over the line, Amtrak installed an underground cable to replace the pole lines to provide for better reliability. The age of the signal system in this area is uncertain, but it was probably installed in the 1970s.

The State of New York obtained a grant to double track the portion of the line between Rensselaer and Schenectady. A completely new signal system is being installed with microprocessor-based interlockings and track circuits between interlockings.

Table 59: Summary of Signals Assets – New York Supported Assets – Leased from CSX and Capital Funded by State of New York

Asset Type	Count	Unit	Av. Install Date	Source Notes
Interlocking				
Wayside Equipment				
Switch Machine	23	Units	1991	2018 asset inventory
Switch Heaters	0	Units	N/A	2018 asset inventory
Signals	89	Units	1991	2018 asset inventory
Movable Bridge	0	Units	N/A	2018 asset inventory
Instrument Houses				
Instrument Building	38	Units	1991	2018 asset inventory
ABS Section				
Wayside Equipment				
Track Circuit Equipment	102	Units	1988	2018 asset inventory
ACES (PTC)	-	Miles	N/A	2018 asset inventory
Crossing				
Wayside				
Grade Crossing	9	Units	1991	2018 asset inventory

National Network (Amtrak Owned) – Signals Assets

Table 60: Summary of Signals Assets – National Network- Amtrak Owned

Asset Type	Count	Unit	Av. Install Date	Source Notes
Interlocking				
Wayside Equipment				
Switch Machine	27	Units	1991	2018 asset inventory
Switch Heaters	0	Units	N/A	2018 asset inventory
Signals	142	Units	1985	2018 asset inventory
Movable Bridge	1	Units	1909	2018 asset inventory
Instrument Houses				
Instrument Building	59	Units	1976	2018 asset inventory
ABS Section				
Wayside Equipment				
Track Circuit Equipment	79	Units	1976	2018 asset inventory
ACES (PTC)	-	Miles	N/A	2018 asset inventory
Crossing				
Wayside				
Grade Crossing	84	Units	1976	2018 asset inventory

State of Michigan Supported Assets – Signals Assets

Table 61: Summary of Signals Assets – National Network- Owned by State of Michigan

Asset Type	Count	Unit	Av. Install Date	Source Notes
Interlocking				
Wayside Equipment				
Switch Machine	2	Units	1991	2018 asset inventory
Switch Heaters	0	Units	N/A	2018 asset inventory
Signals	198	Units	1985	2018 asset inventory
Movable Bridge	0	Units	N/A	2018 asset inventory
Instrument Houses				
Instrument Building	2	Units	1976	2018 asset inventory
ABS Section				
Wayside Equipment				
Track Circuit Equipment	118	Units	1976	2018 asset inventory
ACES (PTC)	-	Miles	N/A	2018 asset inventory
Crossing				
Wayside				
Grade Crossing	224	Units	1976	2018 asset inventory

Amtrak Owned – Communications Assets

The availability of asset data related to communications assets has been identified as an inventory development action for the plan period. In 2017/18, Amtrak Information Technology (IT) engaged consultants to undertake a survey of communications network assets. The result of this is included in the tables below.

Table 62: Summary of Communications Assets – NEC Main Line

Asset Type	Count	Unit	Av. Install Date	Source Notes
Radio				
Base Control Radio Module	94	Units	-	2018 asset inventory – no age data
Network				
DSL Modem	52	Units	-	2018 asset inventory – no age data
IP Gateway	8	Units	-	2018 asset inventory – no age data
Miscellaneous Network Drive	72	Units	-	2018 asset inventory – no age data
Network Switch	1,018	Units	-	2018 asset inventory – no age data
Telecommunications				
Protocol Converter	26	Units	-	2018 asset inventory – no age data
Remote Terminal Unit (RTU)	400	Units	-	2018 asset inventory – no age data
Server	205	Units	-	2018 asset inventory – no age data
Site Monitor	81	Units	-	2018 asset inventory – no age data
Transponder	77	Units	-	2018 asset inventory – no age data
Voice Over IP (VoIP) Radio	51	Units	-	2018 asset inventory – no age data
Wayside Interference Unit (WIU)	199	Units	-	2018 asset inventory – no age data

Table 63: Summary of Communications Assets – NEC Branch Line

Asset Type	Count	Unit	Av. Install Date	Source Notes
Radio				
Base Control Radio Module	27	Units	-	2018 asset inventory – no age data
Network				
DSL Modem	-	Units	-	2018 asset inventory – no age data
IP Gateway	6	Units	-	2018 asset inventory – no age data
Miscellaneous Network Drive	35	Units	-	2018 asset inventory – no age data
Network Switch	101	Units	-	2018 asset inventory – no age data
Telecommunications				
Protocol Converter	-	Units	-	2018 asset inventory – no age data
Remote Terminal Unit (RTU)	57	Units	-	2018 asset inventory – no age data
Server	-	Units	-	2018 asset inventory – no age data
Site Monitor	39	Units	-	2018 asset inventory – no age data
Transponder	44	Units	-	2018 asset inventory – no age data
Voice Over IP (VoIP) Radio	-	Units	-	2018 asset inventory – no age data
Wayside Interference Unit (WIU)	54	Units	-	2018 asset inventory – no age data

C&S Asset Condition

Amtrak's C&S Department conducts a program of condition monitoring activities to identify faults, prioritize intervention and ensure safe operation of the railroad. However, it has recognized a need to improve its condition assessment capability to predict the optimal point of replacement.

Overview

Amtrak Engineering currently conducts an extensive condition monitoring (inspection) program of its C&S infrastructure. The monitoring activities, described below ensure safe operation of the railroad. They are used to identify faults and potential faults which result in prioritized and scheduled maintenance. There is however, little predictive analysis conducted to determine asset-deterioration rates and predict future C&S conditions.

For signals assets inspections, are conducted at intervals in line with the Amtrak AMT-27 standard¹³. AMT-27 is fully compliant with all federally mandated tests and inspections applicable to Amtrak, in accordance with 49 CFR § 236 and 49 CFR § 234. It is noted that while these ensure safe operation of the railroad, they are not an assessment of condition for predictive analysis purposes.

For communications, there is limited assessment of the state of the asset.

Asset Condition Assessment Methodology

Pursuant to 49 U.S.C § 24904(c), Amtrak is required to undertake a "condition assessment of those inventoried assets for which a provider has direct responsibility and to level of detail to monitor and predict performance of assets and inform investment prioritization" (U.S. 49 CFR § 625.25(b)(2)).

In meeting this obligation, Amtrak Engineering has developed a C&S asset condition assessment guide¹⁴ and plans for its implementation are progressing. The guide assesses a series of condition factors, each graded between zero (asset is non-operable) through to five (asset is new or nearly new). The approach will result in a condition index for each asset and will enable assessment of SOGR. For signals assets, Amtrak Engineering considers an asset to be in SOGR when it meets maintenance limits described in AMT-27, when it is in a condition where it can continue to meet and perform the functional requirements for which it was designed, and when the lifecycle investment needs of the asset have been met – including all scheduled maintenance. This is consistent with the definition laid out in U.S. 49 CFR § 625. Amtrak Engineering grades an asset in SOGR if it scores 2.5 on its updated condition assessment framework, described above.

For IALP2019, the age of the asset is being used to estimate the assets SOGR, based on the remaining useful life of the asset. This will be updated through 2019 and 2020 with visual and measured assessments.

¹³ AMTRAK AMT-27, "Instructions for Testing Signal Apparatus and Signal Systems." - Rev 5 Date August 1st 2006.

¹⁴ Infrastructure Asset Condition Guidelines – C&S. Version 5, Issued August 2018.

IALP 2019 – Assessed C&S Asset Condition

For IALP2019, the assessed asset condition of C&S, based on useful life of the asset, is presented in Table 64 and Table 65.

Table 64: 2019 Assessed Condition of Signals assets – Amtrak Owned

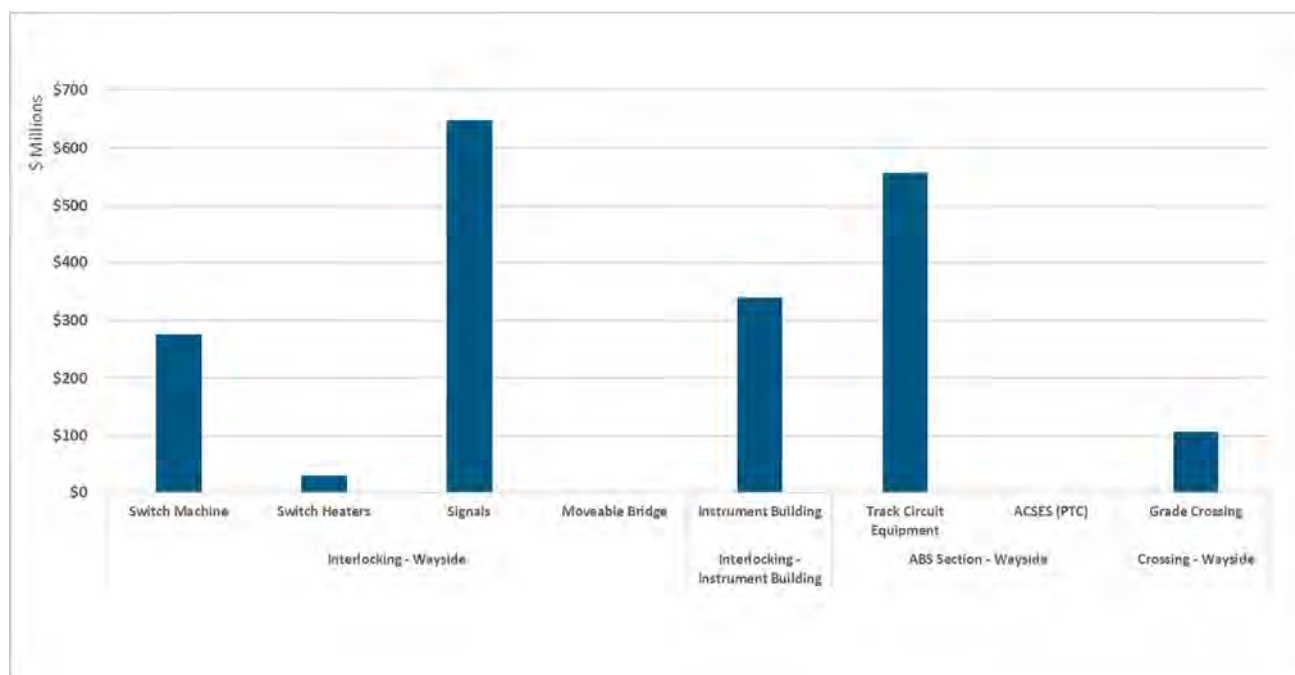
Asset Type	NEC Main Line		NEC Branch Line		National Network	
	Average SOGR	% Not in SOGR	Average SOGR	% Not in SOGR	Average SOGR	% Not in SOGR
Interlocking						
Wayside Equipment						
Switch Machine	2.52	52%	2.38	67%	2.00	100%
Switch Heaters	N/A	41%	N/A	41%	N/A	N/A
Signals	2.69	42%	2.28	55%	2.00	100%
MovableBridge	3.00	10%	1.00	50%	3.00	0%
Instrument Houses						
Instrument Building	2.64	45%	2.96	26%	1.00	100%
ABS Section						
Wayside Equipment						
Track Circuit Equipment	3.00	0%	2.00	100%	1.00	100%
ACES (PTC)	5.00	0%	5.00	0%	-	N/A
Crossing						
Wayside						
Grade Crossing	3.00	0%	3.00	0%	1.00	100%

Table 65: 2019 Assessed Condition of Signals assets – maintained and operated by Amtrak and owned by others

Ownership	Leased from CSX, Capital Funded by State of NY		Owned by State of Michigan	
Asset Type	Average SOGR	% Not in SOGR	Average SOGR	% Not in SOGR
Interlocking				
Wayside Equipment				
Switch Machine	2.00	100%	2.00	100%
Switch Heaters	N/A	0%	N/A	0%
Signals	3.00	0%	2.00	100%
MovableBridge	N/A	N/A	N/A	N/A
Instrument Houses				
Instrument Building	3.00	0%	1.00	100%
ABS Section				
Wayside Equipment				
Track Circuit Equipment	2.00	100%	1.00	100%
ACES (PTC)	N/A	N/A	N/A	N/A
Crossing				
Wayside				
Grade Crossing	3.00	0%	1.0	100%

The replacement value of C&S assets with a condition rating below 2.5, which are assessed as nearing the end of their useful life, is estimated to be [\\$1.96 billion in 2018 dollars](#). This is Amtrak's SOGR Backlog for C&S assets. The largest portion of this is the NEC main-line and branch-line assets owned by Amtrak, which is estimated to be over \$1.49 billion in 2018 dollars. An additional \$64.8 million backlog is present on the CSX leased lines which are capital funded by the State of New York. The national network accounts for \$168.7 million in backlog, with an additional \$235 million backlog on the Michigan owned infrastructure. Figure 30 presents the backlog by C&S asset type.

Figure 30: C&S Estimated SOGR Backlog by Asset Type (\$m 2018)



Risk Management

Risk management continues to be introduced through IALP2019 to support decision making, planning and prioritization.

Overview

The FAST Act requires that both asset and asset management risks are captured to inform investment prioritization and establish implementation strategies.

Currently, risk management occurs across the Engineering Department and is highly focused on maintaining a safe railroad operation. For C&S infrastructure assets, this is achieved through a comprehensive inspection-and-condition monitoring program as defined in the AMT-27 standard. This approach ensures that the railroad is maintained to meet minimum safety standards.

Amtrak acknowledges the lack of established risk analysis, evaluation and management processes for managing longer-term and non-safety risks. As part of I-AMP2017, Amtrak Engineering conducted a basic risk identification exercise for C&S assets and asset management practices. This has been revisited as part of IALP2019.

Amtrak Engineering intend to continue to develop its risk management processes – by establishing a ‘known concerns’ log and by updating and monitoring the risks identified in this asset strategy as part of the annual asset line plan development.

C&S Risk Register

The risk register provided in Table 66 has been captured through consultation with Amtrak C&S engineering staff. Risks have been identified and where possible management actions established.

Risks are grouped in the categories identified in appendix A. The service objective(s), from the Asset and Asset Management Performance section, impacted by the risk are also noted.

Table 66: Signals – Asset and Asset Management Risk Register

Ref:	Route Impact	Risk Description	Risk Impacts (Service Objectives)	Existing/Planned Control
Organization Risks				
CS001	All	Insufficient Signals resources to support track work results in lack of resources to support more preventive maintenance of signals assets and impacts our ability to maintain a reliable asset.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery	<ul style="list-style-type: none"> → Current (national): Signal capital replacement is contracted out on the national network – which reduces risk of lack of qualified resources → Planned: Additional coordination to more efficiently use resources → Planned: Review resource needs as part of wider Engineering Department resource study
CS002	All	Insufficient Signals resources dedicated to capital-program work results in lack of a construction program for Signals and impacts the timely delivery of necessary projects (e.g., dock interlocking).	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery	<ul style="list-style-type: none"> → Current (national): Signal maintenance is contracted out on the national network – which reduces risk of lack of qualified resources. → Planned: Review production resource needs as part of wider Engineering Department resource study
CS003	All	Staff attrition results in reduction of qualified and experienced Signals resources and impacts our ability to deliver work and support other departments.	1. Provide safe and reliable infrastructure for train services	<ul style="list-style-type: none"> → Current (national): Signal maintenance is contracted out on the national network – which reduces risk of lack of qualified resources. → Planned: Work with the represented labor to increase training capacity → Planned: Review resource needs as part of wider Engineering Department resource study
CS004	All	Training capacity limitations result in reduced qualified staff availability and	1. Provide safe and reliable infrastructure for train services	<ul style="list-style-type: none"> → Planned: Work with the represented labor unions to increase training capacity

		impacts our ability to address resourcing issues.		
CS005	All	Inadequate understanding of signals components by track and/or electric traction staff results in unnecessary asset failures/performance issues following track maintenance and impacts the level of additional signals resources needed to support track work.	1. Provide safe and reliable infrastructure for train services	→ Planned: Additional coordination to more efficiently use resources → Planned: Improve cross-disciplinary training
CS017	All	Supply chain decisions to force obsolescence of air-switches results in assets becoming prohibitively more-expensive to maintain, which impacts ability to efficiently maintain service performance.	1. Provide safe and reliable infrastructure for train services	→ No actions planned
Asset Management Risks				
CS006	All except Michigan Lines	A lack of age records for Signals results in ineffective replacement decisions (a primary driver for Signals asset replacement is the age of the equipment) and impacts our ability to prepare long-term plans.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery	→ Current: Extensive paper work in place for Michigan line. Needs capturing in EIMD. → Current: Signals capital program informed by local knowledge that drives prioritization for replacement → Current: As part of I-AMP2017, review and update install dates for assets → Planned: Additional work to update and improve Signals asset data
CS007	All	Poor quality and missing Signals information (for example interlocking machines or signal towers) results in ineffective decision making and impacts our ability to prepare long-term plans.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery	→ Current: Signals capital program informed by local knowledge that drives prioritization for replacement → Planned: Asset registry improvement activities as identified in this plan
CS018	Hudson Line	Poor quality and missing Signals information following transfer of line from CSX results in ineffective decision	1. Provide safe and reliable infrastructure for train services	→ Current: Signals capital program informed by local knowledge that drives prioritization for replacement

		making and impacts our ability to prepare long-term plans.	2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery	→ Planned: Asset registry improvement activities as identified in this plan
CS008	All	Poor quality and missing Signals information (for example interlocking machines or signal towers) results in incomplete capture of cost/work historical data and impacts our ability to forecast maintenance effort needed for assets.	1. Provide safe and reliable infrastructure for train services 2. Obtain funding and financing for infrastructure investment 4. Improve planning and project delivery	→ Planned: Additional work to update and improve Signals asset data
CS019	All	No central coordination of work, results in unnecessary asset failures/performance issues following track maintenance and impacts the level of additional Signals resources needed to support track work.	1. Provide safe and reliable infrastructure for train services 4. Improve planning and project delivery	→ Planned: Establish plan to improve cross-discipline planning in Engineering. Plan also needs to include transportation (for access) and Mechanical (for motive power).

Asset Risks

CS009	All (less of a risk nationally)	The track structure (joint beds, track bed and maintenance of geometry) results in the largest delay (in minutes) from loss of track-circuit signal and impacts our ability to provide reliable infrastructure.	1. Provide safe and reliable infrastructure for train services	→ Current (national): Although the track structure impacting the C&S assets remains a risk, the impact is reduced as the infrastructure is less dense enabling better access → Current: Through problem-cause-remedy reviews, address repeat concerns → Planned: Through improvements to the above process, introduce strategies for targeting improvements
CS010	All	The track structure results in additional wear on switch machines, causing failures, and impacts our ability to provide reliable infrastructure.	1. Provide safe and reliable infrastructure for train services	→ Current: Through problem-cause-remedy reviews, address repeat concerns → Planned: Through improvements to the above process, introduce strategies for targeting improvements
CS011	NEC and Chicago	Air switches—require greater maintenance, more time for maintenance and replacement, and are generally less	1. Provide safe and reliable infrastructure for train services	→ Current/Planned: Replace air switches with electric switches as part of planned capital program

		reliable—result in increased costs and impact service performance.		
CS012	All	Movable Bridges require greater maintenance and are generally less reliable, resulting in increased costs and potential impact to service performance.	1. Provide safe and reliable infrastructure for train services	<ul style="list-style-type: none"> → Current: Ensure preventive maintenance backlog is being addressed at these locations → Planned: Identify root cause and implement appropriate mitigation actions
CS013	All	Microprocessors (vital processors) represent a single point of failure; failures increase in certain operating conditions (New England experience greater failures due to difference in voltage and greater distance between substations), which results in unreliable assets and impacts service performance.	1. Provide safe and reliable infrastructure for train services	<ul style="list-style-type: none"> → Planned: Examine and identify root causes of failures → Planned: Monitor parts obsolescence and optimize the supply chain → Planned: Modify designs to increase reliability and redundancy → Planned: Develop maintenance procedure to ensure conditions of microprocessor housing, as required
CS014	All	Instrument Housings are generally in a poor condition, which results in electronic components being exposed to adverse environmental conditions, and which impacts our ability to provide reliable infrastructure.	1. Provide safe and reliable infrastructure for train services	→ Planned: Inspect the condition of instrument housings and identify assets in need of repair and include in our second infrastructure asset management plan
CS020	All	Instrument Housings are not climate controlled, results in more rapid deterioration and equipment failure due to environmental conditions, which impacts our ability to provide reliable infrastructure.	1. Provide safe and reliable infrastructure for train services	→ No actions planned
CS015	All	Localized flooding risk results in potential asset failures, and it impacts reliability our and ability to quickly recover service. (Hudson is a key risk area).	1. Provide safe and reliable infrastructure for train services	→ Planned: Identify locations prone to flooding and consider asset resiliency improvements based on risk
CS016	All	The age of some Signals assets (including Microprocessors on PTC) introduces	1. Provide safe and reliable infrastructure for train services	→ Current: Holding stock of critical spares

		obsolescence risk as certain components are no longer supported, which results in assets with poor maintainability and which impacts service performance and recovery of service.		→ Planned: Replace un-supported assets as part of planned capital program
CS022	All	Supply chain decisions to update PTC software could result in assets becoming non-operable or prohibitively more-expensive, which impacts ability to efficiently maintain service performance.	1. Provide safe and reliable infrastructure for train services	→ No actions planned
CS023	All	Changes to track infrastructure could result in configuration management issues with PTC equipment, which impacts ability to efficiently maintain service performance.	1. Provide safe and reliable infrastructure for train services	→ No actions planned
CS024	All	Failure to properly reinstall removed equipment results in potential asset operational failures, and it impacts service performance and our ability for recovery of service.	1. Provide safe and reliable infrastructure for train services	→ No actions planned
CS025	All	Failure to properly update PTC equipment results in potential asset operational failures on PTC equipment, and it impacts service performance and our ability for recovery of service.	1. Provide safe and reliable infrastructure for train services	→ No actions planned

C&S Asset Strategy

Lifecycle management strategies updated as part of IALP2019 capture the normalized or steady state activities necessary to maintain a steady state of good repair and ensure C&S assets are functional and able to continue to support a safe, efficient and sustainable national rail network.

Overview

The current C&S lifecycle management approach is reactive, determined by engineering judgement (including assessment of risk through inspections) and focused on maintaining safe rail operations. The overall program is largely driven by the opportunity to access the asset and, as such, the signals program is often closely aligned to the track program. Additionally, current resourcing levels are a key consideration with improvement projects utilizing the majority of signal resources.

Currently, there is no established approach for predicting and prioritizing future investment needs. A capital replacement strategy or plan is not in place; the limited information to support long-term decisions and the number of issues with available resources results in a program that is focused on replacing high-risk assets only.

In I-AMP2017, Amtrak Engineering commenced a review of the lifecycle strategies for all infrastructure assets. Its purpose, was to develop the long-term normalized or steady state infrastructure maintenance and improvement program. Amtrak Engineering recognized that to achieve this requires addressing a sizeable backlog in infrastructure investment before a program of steady state or normalized maintenance can be adopted.

The lifecycle management strategies for C&S infrastructure laid out in the following sections define the approach adopted for the 2019 program, and the revised approach for the years following to address backlog and approach steady state for state of good repair and maintenance spend.

Current Asset Strategies

The current lifecycle management strategies employed by Amtrak to achieve its C&S asset objectives are described in Table 67. Few assets have lifecycle strategies developed, and the run-to-fail approach is generally used. Engineering judgement has been used to determine the 2019 work bank.

The aim of the C&S Department is to maintain and improve the condition of the C&S infrastructure to minimize safety risks and train service impacts. Work is categorized into the following:

- Inspection/monitoring activities to confirm the asset is able to function in its required state and provide a safe operational environment.
- Preventive maintenance activities to achieve a required level of asset performance and maintain a safe operational environment.
- Corrective maintenance activities to return the asset to its required function and restore a safe operational environment.
- Capital maintenance to restore the asset to an operational design standard and maintain performance.
- Capital replacement to renew the asset and maintain performance.
- Capital improvement to replace the asset and improve performance or network capability.

Table 67: Current Lifecycle Management Strategies

Category	Description
Inspection/ Monitoring	<ul style="list-style-type: none"> → Signals – federally mandated inspections as detailed in AMT-27 are always completed. → Communications – Amtrak-specified regular inspection program.
Preventive Maintenance	→ Preventive maintenance is limited due to available resources. AMT-23 ¹⁵ establishes standards for asset general maintenance. There is no current record of whether the assets meet non-federally mandated requirements. Amtrak Engineering recognizes that many assets are currently sub-par.
Corrective Maintenance	→ Focus is on corrective maintenance to ensure safe operations – correcting faults and issues identified in the AMT-27 standard.
Capital Maintenance	→ Capital maintenance (rehabilitation) includes spot replacement of instrument house components (microprocessors, battery track circuits, etc.).
Capital Replacement	<ul style="list-style-type: none"> → Replacement of right-of-way infrastructure, more often driven by track capital program. → Targeted replacement to remove air switch machines and replace with electric switches, again driven by the track capital program (opportunity).
Capital Improvement	<ul style="list-style-type: none"> → Major system upgrades to improve capacity and introduce more modern technology includes: <ul style="list-style-type: none"> ○ Complete interlocking replacements of instrument house. ○ ABS upgrades driven by enhancement (e.g., New Jersey high speed).

Moving Towards Normalized or Steady State Maintenance

As reported in I-AMP2017, there are four key elements to the C&S lifecycle management strategy, namely:

Achieve SOGR	The primary objective of this strategy is to bring C&S assets to a SOGR and maintain them in a steady state, to ensure sufficient capability to meet operational needs.
Prevent Insidious Decline	While Amtrak progresses towards SOGR, the inspection and monitoring regime documented in AMT-27 standard will guard against the insidious decline in the condition of any individual C&S assets and ensure that the asset remains in a safe operational state.
Maintain Performance	The strategy is implemented through a program that is prioritized to ensure the ability of C&S infrastructure to function in its required state, thus minimizing performance loss due to asset faults and failures, temporary speed restrictions or extended outages.
Support Network Capability Improvement	The program is also designed to ensure that C&S assets contribute to capability targets established through the Amtrak Five-Year Service Line Plans and exploit opportunities to enable higher speeds and improved network capacity.

¹⁵ AMTRAK AMT-23, "Special Instructions Governing Construction and Maintenance of Signals and Interlockings." - Rev 4 Date August 1st 2006.



Transition Strategy

The approach taken has been to establish useful life benchmarks (ULBs) to define a program of steady state or normalized maintenance necessary to achieve SOGR. Useful life benchmarks have been established through several sources, including:

- Previous SOGR reports and studies conducted in the last five years
- Engineering review and judgement of typical asset lifecycles on Amtrak property
- Independent review by outside parties
- International benchmarking against comparable rail networks including those in the United Kingdom and Europe

The concept of a useful life benchmark supports the development of a work bank, but, in itself, is not an asset management strategy. This is because the transition to steady state maintenance requires backlog needs to be addressed first. Further, as we move to a steady state replacement cycle, the first iteration needs to be staged (prioritized) such that the ongoing work program is manageable year-over-year. Table 68 and Table 69 summarize the proposed replacement cycles and implementation strategies for signals and communications assets, respectively.

Table 68: IALP2019 Signals Lifecycle Management Strategy

Activity	Lifecycle Strategy / Benefit	Implementation Strategy
Inspection/ Monitoring		
General	<ul style="list-style-type: none"> → To ensure safe Signals operations and prevent insidious decline, continue to perform inspection and monitoring activities on signals assets based on AMT-27 standard. 	<ul style="list-style-type: none"> → No significant change to current practice.
Preventive Maintenance		
General	<ul style="list-style-type: none"> → To ensure safe Signals operation and prevent insidious decline, continue to perform preventive maintenance activities on signals assets based on AMT-27 standard. → To provide a more reliable Signals asset, introduce additional preventive maintenance to ensure signals assets remain in the required standard established in AMT-23. 	<ul style="list-style-type: none"> → No significant change to current practice. → Further preventive maintenance activities to be introduced to remove common causes of asset failures. Analysis of failures to be conducted in 2018/19, followed by implementation plan development in early 2019.
Corrective Maintenance		
General	<ul style="list-style-type: none"> → To ensure safe Signals operation and prevent insidious decline, continue to perform corrective-maintenance activities on signals assets based on AMT-27 standard and AMT-23 standard. 	<ul style="list-style-type: none"> → No significant change to current practice.
Capital Maintenance		
Switch Heaters	<ul style="list-style-type: none"> → To maintain reliability and prevent insidious decline, refurbish switch machines by replacing heating element and other components every 10 years. 	<ul style="list-style-type: none"> → Consistent with current practices. A program of switch heater replacement will reduce whole-life costs.
ABS	<ul style="list-style-type: none"> → To maintain reliability and prevent insidious decline, rehabilitate ABS sections, including replacing microprocessors, batteries and other components every 20 years. 	<ul style="list-style-type: none"> → A program of ABS-section rehabilitation is introduced through this AMP period (2020-2024) based on whole-life-cost justification.

ACSES (i.e., PTC)	→ To maintain reliability and prevent insidious decline, refurbish PTC system, including replacing in-ground components every 10 years and back-office servers every 7 years.	→ A program of PTC-system rehabilitation is introduced through this AMP period (2020-2024) based on whole-life-cost justification.
Central Instrument House	→ To maintain reliability and prevent insidious decline, selectively refurbish instrument housing components every 20 years – including micro-processors and equipment with reduced reliability or obsolescence issues.	→ A program of central-instrument-house rehabilitation is introduced through this AMP period (2020-2024) based on whole-life-cost justification.

Capital Replacement

Switch Machines	<p>Track Class 1-4:</p> <p>→ To achieve SOGR, replace switch machines operating on class 1-4 tracks every 50 years.</p> <p>Track Class 5-8:</p> <p>→ To achieve SOGR, replace switch machines operating on class 5-8 tracks every 40 years.</p>	<p>→ A program of switch-machine replacement is introduced through this AMP period (2020-2024). To manage the backlog of renewals and provide a levelled work program, delivery of the work bank is spread over a 10-year period. This allows establishment and continual use of a production workforce.</p> <p>→ A program of switch-machine replacement is introduced through this AMP period (2020-2024). To manage the backlog of renewals and provide a levelled work program, delivery of the work bank is spread over a 5-year period. For efficient use of track access, replacement of the switch machine will coincide with other interlocking hardware.</p>
Switch Heaters	→ To achieve SOGR, replace the full switch heater cabinet and other components every 40 years.	→ Replacement will be conducted based on whole-life-cost justification and will coincide with Interlocking maintenance/replacement.
ABS	<p>Track Class 1-4:</p> <p>→ To achieve SOGR, replace ABS circuits on class 1-4 tracks every 50 years. This is typically consistent with the track renewal program.</p> <p>→ To maintain performance, replace signals cable as required.</p> <p>Track Class 5-8:</p> <p>→ To achieve SOGR, replace ABS circuits on class 5-8 tracks every 40 years. This is typically consistent with the track renewal program.</p>	<p>→ A program of ABS replacement is introduced through this AMP period (2020-2024). To manage the backlog of renewals and provide a levelled work program, delivery of the work bank is spread over a 10- year period. This is to allow a production workforce to be established and continually utilized.</p> <p>→ Signals cable will be replaced—as required—based on whole-life-cost justification.</p> <p>→ A program of ABS replacement is introduced through this AMP period (2020-2024). To manage the backlog of renewals and provide a levelled work program, delivery of the work-bank is spread over a 5-year period.</p>

		For efficient use of track access, replacement will include all cables and other 'system hardware'.
ACSES (Positive Train Control)	→ To maintain SOGR or support network capability improvement, replace system-wide PTC assets every 25 years or based on whole-life-cost justification of new technology.	→ Further review of PTC-asset conditions will be conducted in 2018/19. A program of replacement will then be established. For budget purposes, we are assuming whole system replacement every 25 years. However, system replacement will be based on whole-life-cost justification of replacement or introduction of new technology to support network capability improvements.
Central Instrument House	→ To achieve SOGR, replace central instrument housing assets every 40 years.	→ A program of central-instrument-house replacement is introduced through this AMP period (2020-2024).
Grade Crossing	→ To achieve SOGR, wayside assets including gate mechanisms, flashes and instrument houses should be replaced every 40 years. Micro-processor-based components should be replaced every 20 years. Other components as required.	→ A program of grade crossing replacement is introduced through this AMP period (2020-2024).
Movable Bridge	→ To achieve SOGR, replace movable bridge detection systems every 40 years.	→ Detection system replacement will coincide with other movable components.
Capital Improvement		
General	→ No complete signal system upgrades are planned within this AMP period (2018-2022). The introduction of new technologies will be considered based on whole-life-cost justification.	
PTC	→ To improve network performance, introduce wayside PTC equipment on Empire and Springfield lines (NEC Branch Lines).	→ Included in the FY2018 and onwards capital program.
Wayside Signals Modernization	→ To improve network performance, program replacement of the wayside signals between interlockings with modern cab-based systems.	→ A program of wayside signals replacement is to be designed in 2019. This is to address reliability issues and remove old, obsolete technology.
Air Switch Machines Modernization	→ To improve network performance, establish a program to replace older air switch machines with more modern electric switch machines (with the exception of Penn Station due to operational reasons).	→ A program of air-switch-machine replacement is introduced through this AMP period, with the majority of air switches replaced over the next 5-year period. For efficient use of track access, replacement will coincide with the track renewal program.

Table 69: IALP2019 Communications Lifecycle Management Strategy

Activity	Lifecycle Strategy/Benefit	Implementation Strategy
Inspection/Monitoring		
General	→ To ensure safe Communications operations and prevent insidious decline, continue to perform inspection activities on communications assets based on Amtrak standard.	→ No significant change to current practice.
Preventive Maintenance		
	→ N/A	
Corrective Maintenance		
General	→ To ensure safe Communications operations and prevent insidious decline, continue to perform corrective maintenance activities on communications assets based on Amtrak standard.	→ No significant change to current practice.
Capital Maintenance		
Shelters, Cabinets, Towers, Duct banks etc.	→ To maintain reliability and prevent insidious decline, rehabilitate all communication facilities—shelters, cabinets, towers and ducts—every 15 years.	
Radio Systems	→ To maintain reliability and prevent insidious decline, rehabilitate the radio systems every 7 years (batteries etc.).	→ Delivery of radio system rehabilitation is spread over a 2-year period to level the work bank.
Capital Replacement		
Shelters, Cabinets, Towers, Duct Banks etc.	→ To achieve SOGR, replace all communication structures—shelters, cabinets, towers and ducts—every 30 years.	

Radio Systems	→ To achieve SOGR, replace complete radio system every 15 years.	→ Delivery of radio systems replacement is spread over a 5-year period to level the work bank.
WAN/ Other Network Devices	→ To maintain SOGR, replace WAN and other network devices every 10 years.	→ Network devices are estimated to be over 20 years old. There is an urgent need to address the backlog over the next 10 years and replace all wayside equipment with fiber.
Application Systems (CCTV, PAS, Intrusion Detection, Access etc.).	→ To maintain SOGR, replace access control devices every 15 years. → To maintain SOGR, replace CCTV every 10 years. → To maintain SOGR, replace Public Announcement System (PAS) every 15 years.	→ Delivery of access control replacement is spread over a 5-year period to level the work bank. → CCTV replacements are typically driven by changes to technology and often funded by grants. Replacement decisions are based on whole-life-cost justification. → Delivery of PAS replacement is spread over a 5-year period to level the work bank.
C-Tec servers (4 of), and CNOC servers (1 of)	→ To maintain SOGR, replace C-TEC and CNOC servers every 5 years.	→ Delivery of server replacement is spread over a 2-year period to level the work bank.

Capital Improvement

General	No communication system upgrades are planned within this AMP period (2018-2022). The introduction of new technologies will be considered based on whole-life-cost justification.	
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Additional Funding Needs

The estimated unconstrained steady state program has been derived from our lifecycle management strategies. The SOGR backlog has been determined based on asset conditions and establishes the transition to a steady state program. A comparison against the FY2019-FY2024 capital program shows a shortfall of \$1.58 billion over the six-year period.

Overview

Pursuant to 49 U.S.C § 24320(a)(2), the funding needs for C&S assets in excess of amounts authorized or otherwise available to Amtrak is described in this section. The following is covered:

- Amtrak's FY2019 to FY2024 capital program provides the next five years fiscally constrained or budgeted work bank (this is included in full in the main-body of the document).
- An SOGR program, based on the assessed condition of the assets, as noted in the C&S Asset Condition section above. For IALP2019 we used age as a proxy for condition. The purpose of this is to identify specific asset priorities and to begin developing a work plan for transitioning to a steady state program.
- A steady state program, based on the useful life benchmarks identified in the C&S Asset Strategy section above. The purpose of this program is to establish the level of normalized renewals necessary to maintain the infrastructure in a SOGR. This assessment neither considers the current condition of the asset nor addresses the backlog, but does provide an indicator of whether annual funding levels are adequate.

FY2019 to FY2024 C&S Capital Program

Table 70 provides a summary of the FY2019 to FY2024 capital investment plan for C&S assets by route/ownership. Further information is included in the [Work Plan and Budget Forecast section](#) of the main-body of this document.

Table 70: Total Asset Class Funding - FY2019 to FY2024 C&S Capital Program - Summary by Route/Ownership (in \$)

Route	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Amtrak Owned						
NEC Main Line	53,892,507	49,236,884	41,907,000	31,762,000	33,525,000	40,230,000
NEC Branch Line	9,722,104	7,690,000	7,750,000	8,750,000	7,250,000	6,250,000
National Network	8,839,390	5,790,000	4,925,000	4,340,000	1,730,000	1,100,000
Maintained and Operated by Amtrak, Owned by Others						
Owned by CSX and funded by State of NY	5,500,000	100,000	-	-	-	-
Owned by the State of Michigan	4,486,843	3,300,000	3,300,000	3,300,000	3,300,000	3,300,000
C&S Capital Program – sub-total	82,440,844	66,116,884	57,882,000	48,152,000	45,805,000	50,880,000
TOTAL	\$ 351,276,728					

Forecast Funding Need to Address SOGR Backlog

Based on the 2018 assessed condition of the C&S asset inventory (see C&S Asset Condition above), the SOGR Backlog for C&S assets is estimated to be **close to \$1.96 billion in 2018 dollars**. Amtrak Engineering acknowledge that the condition of an asset is determined by more than just its age. In 2019 through 2020 we will be implementing a program of condition assessments to further inform our planning and prioritization capability, with future SOGR programs being derived from an improved understanding of asset condition and the deterioration of condition through asset operations.

Given the advancing age of the communications and signals assets and historical underinvestment, Amtrak Engineering determined the need for a **10-year SOGR backlog reduction program**. Without a commitment to address the \$1.96 billion backlog we will face serious operational constraints in the years ahead as the communication and train control infrastructure will reach the end of its useful life, potentially resulting in degradation of service reliability and significant reduction of capacity. The required investment need over the planning period to address SOGR is set out in Table 54. This highlights a \$923 million shortfall against forecast expenditure allocated to address SOGR backlog, non-re-occurring projects and significant projects. We will continue to develop our approaches to identifying backlog and our strategies for addressing SOGR in forthcoming plans.

Table 71: Estimated SOGR Backlog Reduction (10-year Program) - Summary by Route

		Ten Year SOGR Backlog Reduction Program	
Route	Total SOGR Backlog	Estimated Annual Cost	2019-2024 Total Investment Need
Amtrak Owned			
NEC Main Line	\$ 852,016,035	\$ 85,201,603	\$ 511,209,621
NEC Branch Line	\$ 636,543,830	\$ 63,654,383	\$ 381,926,298
National Network	\$ 168,698,665	\$ 16,869,866	\$ 101,219,199
Maintained and Operated by Amtrak, Owned by Others			
NEC Branch Line (Owned by CSX and funded by State of NY)	\$ 64,770,000	\$ 6,477,000	\$ 38,862,000
National Network (Owned by the State of Michigan)	\$ 235,110,870	\$ 23,511,087	\$141,066,522
Amtrak C&S SOGR Backlog 10-Year Program	\$ 1,957,139,400	\$ 195,713,940	\$ 1,174,283,640
	Total	Per annum	Per Plan Period

Forecast Steady State Funding Need

Table 72 below outlines the estimated normalized or steady state program based on the C&S asset strategy and provides an indicator of whether current funding levels are adequate. It should be noted that this represents an unconstrained work bank and establishes the level of normalized renewals necessary to maintain the infrastructure in a state of good repair. It therefore assumes that SOGR backlog is being addressed outside of the funding identified below. For comparison purposes, we have shown the Steady State Investment against the FY2019 to FY2024 capital investment plan. This highlights a \$653 million shortfall over the plan period.

Table 72: Estimated Steady State Program and Comparison to Current Plan - Summary by Route/Ownership

Route	Normalized or Steady State Annual Investment Need	Total Steady State Investment over plan period 2019 -2024	Current 2019-2024 Capital Investment Estimate
Amtrak Owned			
NEC Main Line	\$ 86,079,360	\$ 516,476,158	\$ 250,553,391
NEC Branch Line	\$ 24,710,512	\$148,263,071	\$ 47,412,104
National Network	\$ 4,659,507	\$ 27,957,040	\$ 26,724,390
Maintained and Operated by Amtrak, Owned by Others			
NEC Branch Line (Owned by CSX and funded by State of New York)	\$ 3,123,613	\$ 18,741,679	\$ 5,600,000
National Network (Owned by the State of Michigan)	\$ 7,053,772	\$ 42,322,631	\$ 20,986,843
Amtrak Track Steady State Program	\$ 125,626,763	\$ 753,760,579	\$351,276,728 Total of which \$ 100,369,581 for SS

Further detail on the estimated required steady state production units compared to the average annual production rate is provided in Table 73.

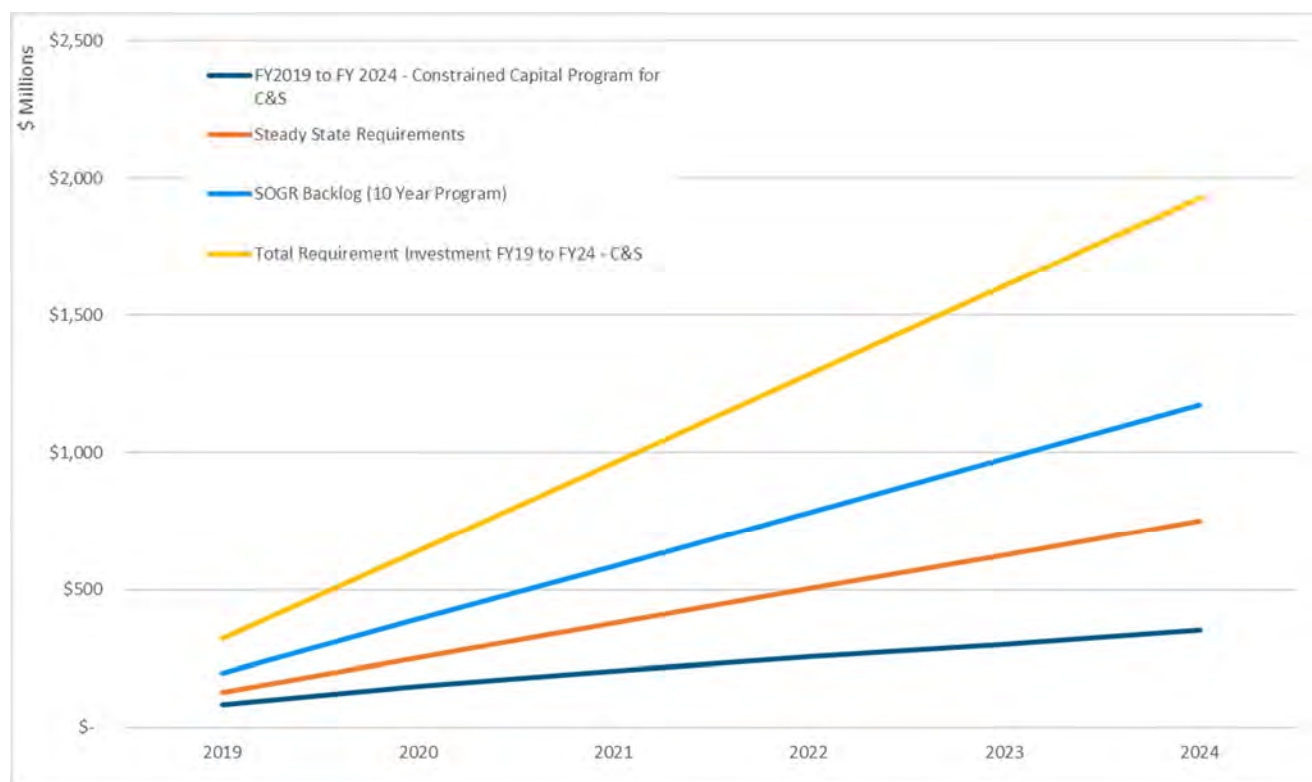
Table 73: Comparison of Estimated Steady State to FY 2019


Activity	Asset Count	Useful Life	Steady State	FY 2019	FY 2020	FY 2021	FY 2022**	FY 2023**	FY 2024**
Switch Machines	2,718	40	68	57	60	65	70	75	78
ABS Sections	3,492	40	87	1	1	2	2	3	3
Grade Crossing	381	25	15	12	10	10	10	10	10
Remote Terminal Unit	457	20	23	10	12	14	16	18	20
Central Instrument House	1,876	40	47	1	2	3	3	3	3

Comparison of Capital Plan, with SOGR Backlog and Estimated Steady State Need

The following figure presents a comparison of the budgeted capital program against normalized steady state level of investment and the level of investment needed to begin addressing the SOGR backlog. This analysis highlights a total \$1.58 billion shortfall across the planning period.

Figure 31: C&S - Comparison of FY2019-2024 Constrained Capital Plan, with Estimated Steady State Replacement and Forecast SOGR Program





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Appendix F: Equipment Asset Strategy

Appendix F provides additional information on Amtrak's Equipment assets and establishes the lifecycle management strategy and consequent work plan to achieve a state of good repair (SOGR).

Overview

Pursuant to 49 U.S.C § 24320(a)(2), this appendix captures the asset strategy for equipment assets to support the transition to normalized or steady state infrastructure replacement and the work necessary to achieve a SOGR of Amtrak's infrastructure. This asset strategy represents our current thinking and enables Amtrak to address the challenges we face from outmoded, unproductive and insufficient equipment. This asset strategy sets out a plan for the acquisition of equipment that will help Amtrak achieve its business goals.

The appendix is structured to be consistent with the main body of the IALP2019 with the following sections:

- [Asset Inventory](#) – provides further details on the equipment assets.
- [Risk Management](#) – presents the asset and asset management risks and related to equipment assets.
- [Asset Strategy](#) – presents the strategy for addressing the current challenges of outmoded, unproductive and insufficient equipment and supporting the move towards steady state replacement of the infrastructure.

Responsible Official

Pursuant to 49 U.S.C. § 24320(c)(3)(c), the following individual is responsible for equipment assets owned or managed by Amtrak:

- William Bates, Senior Director Business Improvement

Background

The performance of Amtrak's equipment has a direct impact on our ability to achieve Steady State Maintenance of Infrastructure.

To remain competitive and grow market share for intercity passenger travel, Amtrak must be able to provide a comfortable customer experience, which includes ride quality and low risk of unplanned service interruptions. Accelerating SOGR work is an integral part of providing customers with a superior product.

This asset strategy is divided into four parts: the life cycle of track; Penn Station New York reliability; the maintenance and repair of infrastructure assets; and the logistics that sustain productivity.

The Economic Life of Track

Achieving and maintaining a SOGR is accomplished by replacing capital components in accordance with an agreed upon annual rate of deterioration called steady state.

The work of replacing assets is done by large machines in consist with an assembly line of smaller support machines. The tempo of work is determined by factors including track possession efficiency where successive blocks of work are driven not only by the speed of the large machine but by the finish of the smaller machines. Pace is also set by the logistics of material fed and removed from the process by work trains, the reliability of the equipment to work without failure, and the skill of the people operating the equipment.

Under the present production configuration steady state levels of capitalization cannot be achieved. Not only are we unable to maintain a SOGR but each year the gap between current state and SOGR widens. Simply stated, [we do not have enough equipment to achieve a SOGR](#).

The performance of each machine in a given production consist, whether executing tie and rail replacement, undercutting or surfacing has a direct impact on the productivity of the entire consist. Each production consist is in effect a process and the functioning of each component plays a significant role in productivity. The current condition of the assets results in unreliable components, which impacts overall productivity.

Another dimension to achieving SOGR is the critical relationship of each of the processes within a larger process. Track assets have varying asset lifecycles (see appendix B), and each cycle frequency must be followed to avoid upsetting the other asset lifecycles. When one asset lifecycle is not delivered then it has a material impact on other asset lifecycles resulting in accelerated deterioration or reduced economic life. By way of example – track surfacing has a 4-5 year cycle - within undercutting, which has a 15-18 year cycle - within rail & tie replacement, which has a 45-50 year cycle. Attaining the economic life of track, essential to any request for stakeholder investment, requires the continuous performance of these three processes.

Amtrak's equipment productivity has diminished due to age. However, a straight one-for-one replacement will not produce sufficient output to meet steady state levels as there must be an increase in current capacity. The emphasis must be on overcoming the current deficiency in annual steady state production to eventually eliminate the backlog identified in this asset line plan.

Penn Station, New York – Reliability Program

On a daily basis, Penn Station New York handles over 1,300 train moves carrying 300,000 people on Amtrak, New Jersey Transit and Long Island Railroad trains. The track structure consists of 120 turnouts, including 35 slip switches, each equivalent to four conventional turnouts, as well as 45 miles of individual track segments. Given the level of usage, some of these assets require either [component or complete replacement within a period as short as five years](#).

Reliable track assets require they be maintained to a SOGR and inspected frequently enough to determine when they are falling below a SOGR. Generally, as assets age, reliability may decline. If asset replacement is delayed there will come a point when even frequent inspections will not guarantee reliability.

In recent years Amtrak has been unable to keep pace with historical steady state replacement levels. For example, between 2009 and 2011 Amtrak invested between \$4 and \$6 million annually. In 2012 and 2013 investment fell to a \$2 million annual level. A major barrier to achieving the higher levels of investment is getting sufficient track time to install switch and slip panels.

Given the unique conditions at Penn Station, a conventional turnout replacement process will not work. Turnouts have to be built outside Penn Station, brought on flat cars in three panels and put in place. The existing turnout is removed the same way, then ballast is brought in, the new installation surfaced and finally returned to service. This should occur within a 55-hour window versus the current three weekend schedule. Specialized equipment suited to this kind of work is required to achieve a SOGR without having to shut down major segments of the station. Each track panel, which weighs 35 tons, has to be travelled and spotted under a crane boom that is limited to 15' clearance above rail due to overhead wire, all the while creating minimum disruption to train service.

Specialized equipment capable of performing work within the limited window is comprised of a 125-ton adjustable counter-weight crane utilizing switch tilter flat cars able to raise the panels on one side to clear obstacles moving from the assembly area to the work site. Once in the station the crane lifts the panels and walks them to the work site, where they are spotted using on-ground mobile controls.

Maintenance and Repair

The task of performing planned and corrective maintenance as well as re-capitalization of assets is not solely the work of large Production gangs using complex equipment consists. Much work is done by small sub-division gangs in extremely short operating windows. The equipment they use is usually cascaded down from larger production gangs.

Each of the twelve Sub-divisions is responsible for the condition of their section of the infrastructure. They repair and replace catenary hardware, bridge ties, switch machines, rail, ties and many other steady state components. Unlike Production, sub-division gangs do not get 24/7 or 55-hour outages. Most of their work is done with overnight track possessions which rarely exceed four to five hours. Available and reliable equipment is crucial to completing sub-division work to allow large production units to operate within normal cycles. Most sub-division equipment is secondhand and much is outside the lifespan of equipment SOGR. [The equipment acquisitions necessary to bring sub-division equipment into a reasonably good steady state is handled outside this Plan](#).

Production Logistic Support

Appendices B through E set out the annual volumes of assets that need to be replaced. For each new asset (rail, tie, ballast, switch) a used asset has to be picked up and taken to a recycling location. Dirty ballast has to be transported to a disposal site. Rarely are these sites near the work site. Currently, there is an insufficient number of owned freight cars and motive power. To compensate, hopper cars as well as motive power are leased.

Scheduling and dispatching material trains is made more complex by the limited number of sidings in which loaded and empty cars can be staged. The current process requires loaded ballast unit trains to be broken up and staged at sidings based on the current construction program provided by Engineering. When stone is needed, the freight group selects loaded ballast cars stored at various locations and schedules the necessary locomotive power and work train crews. This process is inefficient.

For continuous welded rail (CWR), Amtrak annually distribute 1,600 foot CWR strings on six leased rail trains, to locations where major CWR installation work is planned. Used rail is scrapped in place and shipped offsite for disposal. Currently Amtrak does not have the ability to pick up used rail for cascading to yards and sidings; however, an Amtrak rail train is under construction that will be operational in 2018, which will pick up rail and deliver for re-use.

Amtrak's freight fleet was acquired when Amtrak was formed, thus high maintenance needs and the risk of car shortages occur when overhauls lags. Critical sub-fleets supporting SOGR repair programs include ballast hoppers, concrete tie cars, a rail train, and, to a lesser extent, general purpose flat cars and gondolas. The rail industry has a benchmark 50 years of age for the general life expectancy of freight equipment as well as approved interchange with other railroads. Interchange is necessary because large quantities of rail and ballast come from suppliers located on other railroads. Amtrak also routes cars between projects over other railroads, such as New York to New Haven via CSX or Metro North Railroad.

Equipment Asset Inventory

Amtrak owns and/or manages 1,704 M/W Equipment, Trucks and Freight Rolling Stock assets supporting maintenance and capital programs across the national network.

Inventory Description

A Network-wide summary of Equipment assets is shown in Table 74 below. The data is divided into the four principal maintenance plan elements described in the background section above. The groupings generally reflect the type of work performed by equipment. For clarity, the following list provides the grouping and example asset types.

1. **Life Cycle of Track** – includes the following:
 - a. **Rail**: Track Laying Machine, tie cars, cranes, declipper, tie-handling equipment, rail positioner and ballast regulators, rail stretchers, tampers, rail saws and cranes, tampers, stabilizers.
 - b. **Undercutting**: Undercutters, ballast regulators, loaders, excavators, compactors and backhoes.
 - c. **Surfacing**: Tampers, switch tampers, ballast management, stabilizers.
 - d. **Reference Surfacing**: Tampers, switch tampers, ballast management, stabilizers, and catenary wire renewal train.
2. **Penn Station New York Reliability** – 125T crane, tilt car, lifting beam.

3. **Infrastructure Maintenance & Repair** – includes the following:
 - a. **Equipment**: Stabilizers, rail heater sets, speed swings, tampers, tie inserters, regulators, backhoes, loaders, tie cranes, bulldozers and excavators.
 - b. **Truck**: Thermite and EA welding trucks, grapple trucks, knuckleboom/boom trucks, dump trucks, fuel/lube trucks, Brandt trucks.
4. **Logistics Support** – includes the following:
 - a. **Freight Car**: Ballast hopper, concrete tie cars, side dump cars, 60', 70' and 89' flat cars.
 - b. **Motive Power**: HP Locomotive.

Table 74: National Equipment Assets

Asset Type	Count	Unit	Av Inst Date	Average Replacement Cost
Lifecycle of Track				
Rail	302	Each	-	\$ 545,265
Undercutting	286	Each	-	\$ 470,594
Surfacing	70	Each	-	\$ 1,832,857
Reference Surfacing	72	Each	-	\$ 1,981,250
NY Penn Station Reliability Program				
Turnout Replacement	6	Each	-	\$ 1,875,000
Infrastructure Maintenance and Repair				
Equipment	341	Each	-	\$ 718,587
Trucks	147	Each	-	\$ 317,449
Logistic Support				
Freight	480	Each	-	\$ 89,333
Motive Power	0	Each	-	Currently borrowed from MOE

Equipment Asset Condition - Concerns

The Maintenance of Way equipment is key in maintaining Amtrak's nation-wide SOGR, however our ability to deliver the railroad our customers require is constrained by outmoded, unproductive and insufficient equipment. While the condition of the equipment assets is not formally assessed, it is acknowledged that deferred maintenance and capital investment has resulted in an equipment asset inventory which now urgently needs investment.

Maintenance of Way equipment is generally depreciated over 25 years for large equipment and 18 years for smaller equipment. New equipment is usually assigned to large Production gangs and, when replaced, passed down second-hand to the Sub-divisions. Sub-divisions can tolerate unreliable equipment better than Production, although the general state of Amtrak's equipment puts all gangs at significant risk of equipment failure.

The safety and productivity of employees is directly tied to the equipment they use to do the work. Engineering leadership has an obligation to provide equipment that will keep employees safe while maximizing productivity. Unlike Class I railroads, Amtrak Engineering employees work adjacent to tracks with speeds approaching 125 miles per hour. While some gangs get 24/7 possession of the track on which they work, others only receive a brief four-hour nightly window. It is important therefore that the equipment enables productivity to be met to reduce the safety risks associated with maintenance overruns.

Risk Management

Overview

The FAST Act requires that both asset and asset management risks are captured in such a way to inform investment prioritization and establish implementation strategies.

Equipment Risk Register

The risk register provided in Table 75 has been captured through consultation with Amtrak equipment staff. Risks have been identified and where possible management actions established. Amtrak intend to continue to develop its risk management processes – by establishing a 'known concerns' log and by updating and monitoring the risks identified in this asset strategy as part of the annual asset line plan development.

Table 75: Equipment – Asset and Asset Management Risk Register

RID	Risk Description	Treatment
Organization Risk		
EQ001	Unreliable equipment results in safety and productivity risks and impacts Amtrak's ability to deliver maintenance safely and efficiently.	→ Planned: Planned procurement of new equipment to support more efficient work delivery
EQ002	Shortage of qualified equipment operators and repairmen results in reduction in capacity to undertake infrastructure maintenance activities and impacts Amtrak's ability to provide a reliable track infrastructure.	→ No current actions → No actions planned

EQ003	Labor agreements allow senior staff to 'bid-out', which results in a lack of qualified staff and impacts Amtrak's ability to deliver maintenance efficiently.	<ul style="list-style-type: none"> → No current actions → Planned: Re-examine labor agreements to improve ability to retain qualified staff and decrease bidding out
EQ004	Training capacity limitations for repairmen and repairmen helpers result in reduced qualified staff and impacts Amtrak's ability to deliver maintenance efficiently.	<ul style="list-style-type: none"> → No current actions → Planned: Include training in equipment purchase contracts
EQ005	Training capacity limitations for staff operating machinery and equipment result in reduced qualified staff and impacts Amtrak's ability to deliver maintenance efficiently.	<ul style="list-style-type: none"> → No current actions → Planned: Include training in equipment purchase contracts
EQ006	Poor construction programming results in challenges to address priority maintenance and impacts Amtrak's ability to deliver maintenance efficiently.	<ul style="list-style-type: none"> → Current: Construction programming improvements made in 2019 and continuing through the plan period

Asset Management Risks

EQ007	No central coordination of work results in planned work not being completed and impacts our ability to deliver maintenance efficiently.	<ul style="list-style-type: none"> → Planned: Establish plan to improve cross-discipline planning in Engineering. Engage with transportation to more efficiently utilize track access. Engage with Mechanical to ensure motive power is made available.
EQ007	The use of Amtrak's EAM for equipment assets is in its infancy and new to staff; this results in less effective decision making, and it impacts Amtrak's ability to prepare long-term plans as well as ensure equipment is available for short term production schedules.	<ul style="list-style-type: none"> → No current actions → No actions planned

Asset Risks

EQ008	Insufficient facilities are available to properly maintain and rehabilitate rail based equipment, which results in an inability to undertake equipment maintenance and it impacts our ability to perform infrastructure work efficiently.	<ul style="list-style-type: none"> → No current actions → No actions planned
EQ009	General condition of equipment assets results in poor productivity due to unreliable equipment, which impacts ability to perform infrastructure work efficiently.	<ul style="list-style-type: none"> → Planned: Planned procurement of new equipment to support more efficient work delivery
EQ010	Aging and functionally obsolete support equipment results in inefficient use of track time and inefficient delivery of maintenance,	<ul style="list-style-type: none"> → Current: Specialty track equipment requires long lead times (typically two years) and planning to purchase – in the

	and it impacts Amtrak's ability to maintain a reliable track infrastructure. (Note: Tampers -1990's; undercutting machine -1990's; TLM – late 1970's. TLM was designed to replace wood ties with concrete, and is now replacing concrete with concrete).	process of acquiring new equipment, including replacing cranes → Planned: Review and build justification for the purchase of new equipment, recognizing the long lead times for track plant
EQ011	Limited yard space for track maintenance equipment (for example at Adams and Hunter Yard) results in issues with getting equipment out to site and impacts our ability to maintain the infrastructure efficiently.	→ No actions planned
EQ012	Unavailability of dedicated rail grinding equipment results in deteriorating rail and poor rail profile, and it impacts Amtrak's ability to maintain ride quality and adhere to FRA guidelines for high speed rail.	→ Planned: Establish plan for rail grinding, and review opportunity to coordinate with other rail industry partners (LIRR & MNR) to obtain equipment (or access to equipment)

Equipment Asset Strategy

Amtrak's equipment strategy is designed to support Engineering's transition to Normalized or Steady State Maintenance.

Overview

Amtrak is unable to deliver the railroad our customers require with the resources we have. We are constrained by outmoded, unproductive and insufficient equipment, inadequate track time and lack of qualified personnel. These factors result in a cost per unit that cannot be justified and an inability to achieve a state of good repair and provide superior ride quality.

To address the challenges facing the Corporation from outmoded, unproductive and insufficient equipment, the Engineering Department has prepared an equipment asset strategy that proposes acquisition of equipment that will help Amtrak achieve its business goals.

This asset strategy sets out a plan for the acquisition of equipment that will help Amtrak achieve its business goals. The strategy is designed based on our current production capacity and our forecast production capacity – to address state-of-good repair and transition to steady state.

Equipment Work Plans and Budget Forecasts


The Plan calls for an investment of \$367 million to acquire one track laying system, two undercutters, three high speed surfacing consists, reference surfacing, Penn Station NY heavy lift cranes, and the necessary freight cars and motive power to support their logistics needs.

Overview

Funding is summarized into four parts and presented in Table 84 below. Table 5 on the following page provides a detailed by year forecast of funding needs.

Table 76: Five Year Funding Requirements

Equipment Assets	Five Year Funding Requirement	Average Replacement Cost
Lifecycle of Track	\$239,766,000	
Rail	\$ 52,809,000	May 2018 Amtrak Board Funding Request
Undercutting	\$ 92,207,000	May 2018 Amtrak Board Funding Request
Surfacing	\$ 34,700,000	May 2018 Amtrak Board Funding Request
Reference Surfacing	\$ 60,050,000	May 2018 Amtrak Board Funding Request
NY Penn Station Reliability Program	\$9,000,000	
Turnout Replacement	\$9,000,000	May 2018 Amtrak Board Funding Request
Infrastructure Maintenance and Repair	\$127,675,000	
Equipment (recurring equipment purchases)	\$ 105,650,000	Funded through existing programs
Trucks (recurring equipment purchases)	\$ 22,025,000	Funded through existing programs
Logistic Support	\$ 117,730,000	
Freight	\$ 109,330,000	May 2018 Amtrak Board Funding Request
Motive Power	\$ 8,400,000	May 2018 Amtrak Board Funding Request
Amtrak Totals		
May 2018 Amtrak Board Funding Request	\$366,496,000	
Funding Through Existing Programs	\$127,675,000	



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Appendix G: FAST Act Asset Management Plan Requirements

In December 2015, the US Government enacted the Fixing America's Surface Transportation (FAST) Act. The funding and authorization bill places specific asset planning and asset management requirements on Amtrak.

This plan is designed to satisfy both the US Federal FAST Act requirements for asset plans – 49 U.S.C § 24320(c) and requirements for an asset management plan – 49 U.S.C § 24904. Table 77 below demonstrates alignment to these requirements.

Table 77: Summary of FAST Act Asset Management Requirements against the IALP2019

Federal Requirement	I-AMP2019 Section
49 U.S.C § 24320(c)(2) – Amtrak 5-Year Asset Plans	
Requires the production of a 5-year asset plan for infrastructure – including all Amtrak controlled Northeast corridor assets and other Amtrak-owned infrastructure and the associated facilities that support the operation, maintenance and improvement of those assets	
The plan shall include:	A summary of the strategic plan for each asset category is included in the Asset Strategy section of each asset class Appendices (B-F) . Goals and objectives and how we measure performance are presented in the Asset and Asset Management Performance section.
a) A summary of Amtrak's 5-year strategic plan for each asset category, including goals, objectives, any relevant performance metrics and statutory or regulatory actions affecting the assets;	
b) Inventory of existing Amtrak capital assets, to the extent practicable, including information regarding shared use or ownership, if applicable;	An inventory of all national and NEC assets is presented in the Asset Inventory section. Further detail is included in the each of the asset class Appendices (B-F) . Both New York supported and Michigan owned assets are broken out into separate sections, throughout this document.
c) A prioritized list of proposed capital investments, that	A prioritized list of proposed capital investments is summarized in the Constrained Infrastructure Capital Program section and presented in full in Appendix H .


c) (i)&(ii) Categorizes each capital project as being primarily associated with (1 or more of 5 categories)	Each project is categorized using the definitions presented in Appendix H – aligned to this requirement.
c) (iii) Describes the anticipated business outcome of each project or program identified, including an assessment of –	A summary statement with the anticipated business outcomes, the potential effects on passenger operations, safety, resilience and potential impact on Amtrak’s ability to meet regulatory requirements are presented against each project presented in Appendix H .
c)(iii)(I) The potential effect on passenger operations, safety, reliability and resilience;	
c)(iii)(II) The potential effect on Amtrak’s ability to meet regulatory requirements if the project or program is not funded	
c)(iii)(III) The benefits and costs	A benefits matrix is being applied to each project and estimated costs are included against each project presented in Appendix H .
d) Annual profit and loss statements and forecast and balance sheets for each for each asset category	Budget forecasts are presented in the Constrained Infrastructure Capital Program section. We have also presented steady state estimates and forecast investments for each asset class in the asset class Appendices (B-F) .
(3) In meeting the requirement Amtrak will:	
A) Consult with each business line described in subsection (b)(1) in the preparation of each 5-year asset plan and ensure integration of each 5-year asset plan with the 5-year business line plans;	The plan has been aligned to the 5-year Service Line plans as discussed in the Introduction and the Asset and Asset Management Performance section.
B) As applicable, consult with the Northeast Corridor Commission, the State-Supported Route Committee and owners of assets affected by the 5-year asset plans;	Stakeholder Engagement is discussed in the Introduction section. The infrastructure asset line plan is shared with the NEC and SSRC at first final draft stage (November 2018) to allow time for comment.
C) Identify the appropriate Amtrak officials that are responsible for each asset class category.	The responsible officials for each asset class are identified in the Introduction section and named against each asset class Appendix (B-F) .
49 U.S.C § 24904(c) – Northeast Corridor Asset Management	
Requires the development of an asset management system and production of a Northeast corridor asset management plan that is consistent with the Federal Transit Administration process codified in Transit Asset Management Plans 49 CFR § 625.	
The plan shall include as a minimum:	An inventory of all national assets is presented in the Asset Inventory section.
a) An inventory of all capital assets	An assessment of asset condition is presented in the Asset Inventory section.
b) An assessment of asset condition	
c) A description of the resources and processes necessary to bring or maintain those assets in a state of good repair, including decision-support tools and investment prioritization methods	The resources, processes, decision support tools and investment prioritization methods are presented in the Asset Management Plan – Appendix A .

d) A description of changes in asset condition since the previous version of the plan	A description of change in asset condition will be included in subsequent versions of this plan in the Asset Inventory section.
In addition 49 CFR § 625 (c) requires:	Proposed capital investments are presented in the Constrained Infrastructure Capital Program section.
i. A prioritized list of projects or programs to manage or improve the State of Good Repair of capital assets	
ii. An Asset Management Policy – setting out the executive level direction regarding expectations for asset management	Amtrak Engineering’s Asset Management Policy is presented in the Asset Management Plan – Appendix A .
iii. An implementation strategy – that sets out the operational actions that a transit provider decides to conduct in order to achieve asset management goals and policies	A summary of the implementation strategy is presented in the Asset Strategies section.
iv. List of key annual activities needed to implement an asset management plan for each year of the plan’s horizon	Key activities to implement the plan are presented in the Asset Management Plan – Appendix A . Improvement activities identified as part of this plan development are presented in the Improvement Plan section in Appendix A.
v. A summary of the resources including personnel that a provider needs to develop and carry out the asset management plan	Resource and access requirements are set out in the Constrained Infrastructure Capital Program section. Asset Management resources – including organization and responsibilities are set out in the Asset Management Plan – Appendix A .
vi. An outline of how a provider will monitor, update, and evaluate, as needed, its asset management plan and related business practices, to ensure the continuous improvement	The process for monitoring, updating and evaluating this asset line plan is included in the Introduction section. Processes, related to monitoring and continual improvement of our asset management practices, including our improvement plan are presented in the Asset Management Plan – Appendix A .

International Standards for Asset Management

ISO-55001:2014 is an international standard for best practice asset management that provides a framework for management and control of physical assets and sets the scope of the target state for leadership, organization, processes, procedures, policy, plans and continual improvement.

IALP2019 has been developed in alignment with the requirements set out in ISO-55001:2014.



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Appendix H: Constrained Infrastructure Capital Investment Program

This section presents the CONSTRAINED list of infrastructure capital investments (as of January 2019). Pursuant to 49 U.S.C. § 24320(a)(2) our plan considers funding levels authorized or otherwise available to Amtrak in FY2019. In the absence of an authorization or appropriation of funds for FY2020 to FY2024, as per the regulations, the plan is based on the amount of funding available in FY2019. Projects are grouped by asset class and by route/ownership.

Overview

Amtrak's Engineering capital investment program (CIP) provides \$825.72 million in FY2019, of which \$668 million is direct investment in infrastructure assets (see Table 78).

Many of the projects included in the CIP are programs of work to address normalized or steady-state replacement and SOGR backlog replacement. Amtrak's current planning approach is to estimate the required program based on the overall condition of the assets. The planning of which asset gets replaced in a given period is considered part of the development of the construction plan. This

exercise is undertaken in the 9-month period leading up to the financial year as highlighted in the [Revised Planning Schedule](#) section in the [Introduction](#). This approach enables Amtrak to react to the emerging situation typical of an organization managing assets in a poor state of repair. Integration between the asset line plan development and updates to the infrastructure five-year capital program and one-year construction program commenced in 2017 and we expect the planning efforts to be fully integrated from 2019 onwards.

Table 78: Amtrak CONSTRAINED Infrastructure Capital Program (FY2019 to FY2024) – By Route/Owner (\$)

	Route/Owner	FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	TOTAL
SUMMARY	Engineering Capital Program - Infrastructure							
	Amtrak Owned Infrastructure (including Engineering Significant Projects)							
	NEC Main Line	521,949,766	641,847,072	668,790,423	733,613,205	779,213,968	1,191,020,616	4,536,435,050
	NEC Branch Line	54,202,104	52,424,850	64,746,311	54,393,578	34,864,770	34,264,211	294,895,824
	National Network	64,609,390	65,402,000	48,507,361	53,976,286	52,636,375	53,314,564	338,445,976
	Infrastructure Owned by Others, Amtrak Operated/Maintained							
	CSX/ New York	15,100,000	8,700,000	1,500,000	1,507,500	1,515,225	1,523,182	29,845,907
	Michigan Owned	12,137,990	11,364,681	11,606,622	4,057,981	4,080,720	4,104,142	47,352,136
	Eng. Prjct Mgmt	8,360,000	7,383,650	7,250,000	7,500,000	8,000,000	8,500,000	46,993,650
	TOTAL – Eng. Infra.	676,359,250	787,122,253	802,400,717	855,048,550	880,311,058	1,292,726,715	5,293,968,543
	Engineering Department Capital Program – Non-Infrastructure							
	Equip. & Vehicles	85,985,000	91,624,750	212,405,400	177,238,882	47,170,398	48,585,512	663,009,942
	Engineering IT Prjts.	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	24,000,000
	Stations/Real Estate	59,378,888	40,600,000	51,250,000	121,150,000	131,250,000	63,150,000	466,778,888
	Other Department – Capital Program – Infrastructure							
	Miscellaneous	66,960,179	62,492,066	56,242,882	55,161,279	51,577,399	52,593,216	345,027,021
	Other significant Prjts.	-	27,300,000	6,830,000	-	-	-	34,130,000
	Gateway Program	71,701,353	287,201,314	218,097,573	249,192,308	237,129,372	127,430,213	1,190,752,133
TRACK	Amtrak Owned Infrastructure (Including Significant Projects)							
	NEC Main Line	348,477,102	370,121,250	368,475,387	403,489,027	436,067,435	366,305,616	2,292,935,817
	NEC Branch Lines	29,080,000	18,684,900	17,050,447	17,426,961	17,814,770	18,214,211	118,271,289
	National Network	38,220,000	42,812,000	38,282,361	44,836,286	46,106,375	47,414,564	257,671,586
	Infrastructure Owned by Others, Amtrak Operated/Maintained							
	CSX New York	4,600,000	4,600,000	1,250,000	1,257,500	1,265,225	1,273,182	14,245,907
	Michigan Owned	7,651,147	8,064,681	8,306,622	757,981	780,720	804,142	26,365,293
	TOTAL – TRACK	428,028,249	444,282,831	433,364,817	467,767,755	502,034,525	434,011,715	2,709,489,892
B&B	Amtrak Owned Infrastructure							
	NEC Main Line	55,638,000	73,256,847	105,600,000	156,300,000	181,800,000	710,800,000	1,283,394,847
	NEC Branch Lines	9,450,000	14,500,000	6,500,000	6,500,000	6,500,000	6,500,000	49,950,000
	National Network	17,550,000	16,800,000	5,300,000	4,800,000	4,800,000	4,800,000	54,050,000
	Infrastructure Owned by Others, Amtrak Operated/Maintained							
	CSX New York	5,000,000	4,000,000	250,000	250,000	250,000	250,000	10,000,000
ET	Michigan Owned	-	-	-	-	-	-	-
	TOTAL – B&B	87,638,000	108,556,847	117,650,000	167,850,000	193,350,000	722,350,000	1,397,394,847
	Amtrak Owned Infrastructure							
	NEC Main Line	63,942,157	149,232,091	152,808,036	142,062,178	127,821,533	73,685,000	709,550,995
C&S	NEC Branch Lines	5,950,000	11,549,950	33,445,864	21,716,617	3,300,000	3,300,000	79,262,431
	TOTAL – ET	69,892,157	160,782,041	186,253,900	163,778,795	131,121,533	76,985,000	788,813,426
	Amtrak Owned Infrastructure							
C&S	NEC Main Line	53,892,507	49,236,884	41,907,000	31,762,000	33,525,000	40,230,000	250,553,391
	NEC Branch Lines	9,722,104	7,690,000	7,750,000	8,750,000	7,250,000	6,250,000	47,412,104
	National Network	8,839,390	5,790,000	4,925,000	4,340,000	1,730,000	1,100,000	26,724,390
	Infrastructure Owned by Others, Amtrak Operated/Maintained							
	CSX New York	5,500,000	100,000	-	-	-	-	5,600,000
	Michigan Owned	4,486,843	3,300,000	3,300,000	3,300,000	3,300,000	3,300,000	20,986,843
C&S	TOTAL – C&S	82,440,844	66,116,884	57,882,000	48,152,000	45,805,000	50,880,000	351,276,728

FAST Act Capital Project Categorization

Pursuant to 49 U.S.C. §24320(c)(2)(C)(i), projects presented in this asset plan have been categorized with one or more of the following five categories - definitions have been further developed and are aligned to industry standards, including both PRIIA and the NECC Cost Allocation Policy.

1. **Normalized Capital Replacement** – Normalized or steady state capital replacement is defined as the replacement of an asset on a regular schedule to maintain the asset in a state of good repair (SOGR) once it is in that condition. The replacement occurs when the asset is approaching the end of its useful life and includes assets that are graded as SOGR 2 (marginal) or lower.
2. **Backlog Capital Replacement** – Backlog capital replacement is defined as the replacement of assets that are either no longer functioning as designed or are in service beyond their expected useful life – where the asset may still be functioning as designed but faces imminent heavy repair or replacement to overcome a “backlog” of regular maintenance. Backlog is composed of both basic asset replacement and major projects. Basic asset replacement is typically performed on assets that have had inadequate maintenance over a long period of time or have not been replaced within standard life cycles. Major Backlog replacement refers to projects necessary for achieving a SOGR, but are not undertaken on a routine basis, such as rehabilitation or replacement of bridges and tunnels. These projects include basic infrastructure components and may include improvement elements where in-kind replacement is impossible or undesirable. When replacing a major structure, it makes sense to scope all contemplated work into a single project to save both time and money.
3. **Improvements to support service enhancements or growth** – Improvements are defined as any capital investment in an additional asset, or the out of cycle

replacement of an existing asset that is designed to improve the service performance of the infrastructure. Improvements can improve reliability, increase capacity, reduce travel time, or improve the customer experience. The replacement of any existing asset with anything other than the modern-day equivalent with an asset that provides additional capability should be partially considered as a (1) or (2) above and the additional cost for the enhanced capability considered as (3).

4. **Strategic initiatives that will improve overall operational performance, lower costs, or otherwise improve Amtrak’s corporate efficiency** – Strategic initiatives are capital investments designed to improve Amtrak’s ability to deliver infrastructure in a SOGR – safely, efficiently and economically. Strategic initiatives include the purchase of new equipment to support more efficient work practices, as well as investment in the infrastructure to address future risks (for example the early replacement of assets to prevent obsolescence risk).
5. **Statutory, regulatory, or other legal mandates** – Mandatory initiatives are defined as any capital investment required by law or regulation or to protect public health and specifically designed to address a statutory, regulatory or other legal mandate. These include environmental remediation, right-of-way fencing, infrastructure and station resiliency and security systems, Positive Train Control (PTC), and station access improvement.

FAST Act Capital Project Benefits

Pursuant to 49 U.S.C. §24320(c)(2)(C)(iii)(III), projects presented in this asset plan have been assigned benefits from the following list:

- **Safety** – Project is identified as providing safety improvements to rail operations. This can include both maintaining operational safety (enabling the asset to perform its required duty safely), as well as improving safety (through the removal of known safety concerns – e.g. grade crossings).
- **Journey Time Capability** – Project is identified as providing direct user benefits through reduced trip times, improved reliability, and improved ride quality/customer experience.
- **Environmental** – Project is identified as reducing environmental impacts including supporting improved train operations (reducing emissions) and improving noise and other environmental disturbances.
- **State of Good Repair** – Project is identified as improving the SOGR of the asset, which provides operational performance efficiencies and safety improvements through less reactive maintenance, less faults and failures and better reliability.
- **Resilience** – Project is identified as improving the asset resiliency to disturbances that result in service disruption. This can include improving weather protection, protection against localized flooding, protection against vandalism or other external disruption.

Track – FY19 to FY24 Constrained Capital Program

Track Capital Program - NEC Main Line

C.EN.101652 - AMTRAK NEC TLS CONCRETE TIE REPLACEMENT

The Track Laying System (TLS) is a mechanized out-of-face rail and concrete tie replacement unit utilizing the Track Laying Machine (TLM). TLS Blue is a 129-person team made up of five gangs (Head-End, TLM, Clipping, Surfacing and Material Handling). In addition, TLS is typically supported by C&S, ET, B&B, Division Track, T&E and Holland Welders.

Location: NEC wide.

FAST Act Category:

- Normalized Replacement
-

Construction

Program Priority:
13

Project Benefits:

- Safety
- Journey Time Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101652 Total
\$56,748,738	\$58,451,200	\$60,204,736	\$124,021,756	\$127,742,409	\$65,787,341	\$492,956,180

C.EN.100269 - AMTRAK NEC SYS UNDERCUTTING PROGRAM This Program will move the Railroad toward SOGR by eliminating component failures and reducing maintenance costs. Undercutting will reduce slow orders occurring where the track geometry has a rapid degradation, thereby decreasing service delays. In addition, the life of the rail and ties will be preserved, reducing costly spot replacements. Location: NEC wide.				FAST Act Category: - Normalized Replacement Also supports: - Backlog Capital Replacement - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: 13 Project Benefits: - SOGR
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100269 Total
\$58,211,239	\$59,957,576	\$61,756,303	\$63,608,993	\$85,000,000	\$107,850,000	\$436,384,111

C.EN.101656 - AMTRAK NEC TIE-TIMBER REPLACEMENT The NEC Tie/Timber Replacement Program replaces wood ties and timbers along the Northeast Corridor that have lost their ability to hold their gage (distance between the track), due to continued use, loss of strength and increased age. Location: NEC wide.				FAST Act Category: - Normalized Replacement Also supports: - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: 13 Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101656 Total
\$20,520,000	\$21,135,600	\$21,769,668	\$22,422,758	\$23,095,441	\$23,788,304	\$132,731,771

C.EN.101104 - PENN STA NY INFRASTRUCTURE RENEWAL PROGR

The Penn Station Infrastructure Renewal Program will replace milestone track infrastructure components in NY Penn Station before in-service failure occurs. Fully reconstructed zones of track will include concrete block tie, direct fixation and ballasted body tracks, and total replacement of turnouts, complex Track work and ballasted track in "A", "C", "JO" and "KN" Interlockings and Ladder Tracks. Work will be planned to minimize impact to train operations when possible, but body track work and major interlocking rehabilitation efforts will require train schedule modifications from Amtrak, New Jersey Transit & Long Island Railroad. Body track work will be performed as annual cycle and priority of tracks will be determined through inspection and evaluations by Amtrak employees and outside consultants. The project would provide benefit in regard to operation flexibility, reliability improvement, and allow for future maintenance outages.

Location: Linecodes - AT, AE, AZ and AN. Penn Station, NY. PRIIA segments 10,11,12 and 27.

FAST Act Category:

- Normalized Replacement

Also Supports:

- Normalized Capital

Replacement

- Backlog Capital

Replacement

- Strategic initiative that improves operational performance and efficiency

Construction

Program Priority:
15

Project Benefits:

- Journey Time

Capability

- SOGR

- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101104 Total
\$33,000,000	\$28,000,000	\$33,000,000	\$33,000,000	\$33,000,000	\$33,000,000	\$193,000,000

C.EN.101649 - AMTRAK NEC SURFACING PROGRAM

The NEC Surfacing Program performs high speed surfacing on the tracks throughout the Northeast Corridor. This is a flexible Program that is continually changing. Due to it's ability to be flexible, it takes the least priority when other Track assignments need to be placed ahead. The NEC Track Surfacing Program is also subject to change due to factors such as weather, the availability of track outages and changes in the schedule of the SES, Undercutter and TLS.

Location: NEC wide.

FAST Act Category:

- Normalized Replacement

Also supports:

- Improvements to support service enhancements or growth

- Strategic initiative that improves operational performance and efficiency

Construction

Program Priority:
13

Project Benefits:

- Safety

- Journey Time

Capability

- SOGR

- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101649 Total
\$25,165,023	\$26,949,974	\$27,758,473	\$28,591,227	\$29,448,964	\$30,332,433	\$168,246,094

C.EN.101660 - AMTRAK NEC TURNOUT RENEWAL PROGRAM The NEC Turnout Renewal Program replaces wayside and interlocking turnouts throughout the Northeast Corridor. Also performed under this Program is the removal of old ballast and track to restore proper drainage and the installation of new track panels. Location: NEC wide.				FAST Act Category: - Normalized Replacement		Construction Program Priority: 12 Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101660 Total
\$14,500,000	\$14,935,000	\$15,383,050	\$15,844,542	\$16,319,878	\$16,809,474	\$93,791,944
C.SP.100086 - ATTLEBORO LINE RTE128 - NEW 3RD TRACK Design and construction of 2.75 miles of new Track 3 between Route 128 Station (MA) West Lead and Transfer Interlocking. Cost of track and signal design and construction is \$39.0 M, to be funded by MBTA. Cost of overhead catenary system is \$22.5 M, to be funded by Amtrak Location: Linecode - AB, milepost 218.26.Route 128 station, MA. PRIIA segment 1.				FAST Act Category: - Improvements Also Supports: - Strategic initiative that improves operational performance and efficiency - Improvements to support service enhancement or growth		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.SP.100086 Total
\$2,250,000	\$0	\$0	\$0	\$0	\$0	\$2,250,000
C.EN.101661 - AMTRAK NEC RAIL REPLACEMENT PROGRAM The NEC Rail Replacement Program is a continuous program in the Northeast Corridor that replaces rail that is approaching the end of its useful service life or meeting the horizontal or vertical wear limits throughout the Amtrak System. Location: NEC wide.				FAST Act Category: - Normalized Replacement Also supports: - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: 11 Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101661 Total
\$9,500,000	\$8,000,000	\$8,240,000	\$8,487,200	\$8,741,816	\$9,004,070	\$51,973,086

C.SP.100087 - YALE INTERLOCKING-NEW I/L CONSTRUCTION

Construction of a new, wired universal interlocking in Clinton, CT that would split the current 16-mile long block between Guilford and View Interlockings. Construction would include the installation of #24 clothoidal turn-outs, rail, switch ties, sub-grade, ballast, components of the overhead catenary system, signal transformers, signal cables, signal masts, switch heaters, switch machines, switch houses, instrument houses, and interlocking lighting.

Justification: A new interlocking in Clinton would increase the flexibility of Shore Line East and Amtrak operations. This new interlocking would enable SLE trains to flexibly service the existing and future platforms at Clinton and Madison stations and make greater use of the Clinton siding, a short stretch of third track along the south side of the NEC. By enabling SLE trains to use all platforms and tracks in the area, the interlocking would enable Amtrak and SLE to expand services while reducing train conflicts and their resulting delays.

This project is co-funded with the CDOT.

FAST Act Category:

- Improvements

Also Supports:

- Strategic initiative that improves operational performance and efficiency
- Improvements to support service enhancement or growth

Construction

Program Priority:

N/A

Project Benefits:

- Safety
- Journey Time
Capability
- Resilience

Location: Linecode - AB, milepost 90.4 to 105.9. PRIIA segment 5.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.SP.100087 Total
\$673,000	\$17,000,000	\$14,000,000	\$375,000	\$0	\$0	\$32,048,000

C.EN.101655 - AMTRAK NEC JOINT ELIMINATION PROGRAM

Joint Elimination is an on-going program in the Northeast Corridor that funds the elimination of rail joints. These rail joints are created by base corroded rail change outs, Sperry car change outs, surface bent rail, engine burns, defective welds, project related, and other rail defects.

Location: NEC wide.

FAST Act Category:

- Normalized Replacement

Also Supports:

- Strategic initiative that improves operational performance and efficiency
- Improvements to support service enhancements or growth

Construction

Program Priority:

12

Project Benefits:

- Journey Time
Capability
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101655 Total
\$6,750,000	\$6,952,500	\$7,161,075	\$7,375,907	\$7,597,184	\$7,825,100	\$43,661,766

C.EN.101651 - AMTRAK NEC DRAINAGE-ROADBED IMPROVEMENTS This project covers drainage improvements across the Northeast Corridor. This work includes, but is not limited to: Vacuum Train, Badger Ditcher/Gradall, Slot Train, Shoulder Cleaner, Slope Stabilization, and Drainage Improvements. Location: NEC wide.				FAST Act Category: - Normalized Replacement Also Supports: - Strategic initiative that improves operational performance and efficiency - Improvements to support service enhancements or growth		Construction Program Priority: 12 Project Benefits: - Safety - Journey Time Capability - Environmental - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101651 Total
\$8,150,000	\$6,000,000	\$6,180,000	\$6,365,400	\$6,556,362	\$6,753,053	\$40,004,815
C.EN.101647 - AMTRAK NEC SPOT UNDERCUTTING PROGRAM Perform spot undercutting and/or rail vacuuming maintenance with 3rd party Rail Vacs (Loram) or Vac Trucks in locations determined by System Track and Division Maintenance groups to remove mud spot locations along the NEC Spine. Location: NEC wide.				FAST Act Category: - Normalized Replacement Also supports: - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: 13 Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101647 Total
\$7,200,000	\$7,416,000	\$7,638,480	\$7,867,634	\$8,103,663	\$8,346,773	\$46,572,550
C.SP.100085 - NEWARK DE & DAVIS I/L-SECTION IMPROVE Section improvements between Newark Station and Davis Interlocking to support faster, more reliable and more frequent service for all NEC users. Location: Linecode - AP, milepost 38.3 (Davis I/L). PRIIA segment 20.				FAST Act Category: - Normalized Replacement Also supports: - Normalized capital replacement - Backlog capital replacement		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.SP.100085 Total
\$11,379,102	\$0	\$0	\$0	\$0	\$0	\$11,379,102

C.EN.101658 - AMTRAK NEC INTERLOCKING STEEL RENEWAL This is an on-going project for the renewal of interlocking steel components. This work includes insulated joints, switch points, stock rails, and frogs. It is considered the most difficult of the infrastructure to maintain because they are located between the main track of the Northeast Corridor, and where trains gain access, or egress to, or from the Corridor.	FAST Act Category: - Normalized Replacement -	Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
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Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101658 Total
\$6,850,000	\$7,055,500	\$7,267,165	\$7,485,180	\$7,709,735	\$7,941,027	\$44,308,607

C.EN.101650 - AMTRAK NEC RIDE QUALITY IMPROVEMENTS Ride quality improvement program is to diminish rough spots along the right of way on the Northeast Corridor.	FAST Act Category: - Improvements - Strategic initiative that improves operational performance and efficiency	Construction Program Priority: 13 Project Benefits: - Journey Time Capability
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Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101650 Total
\$3,000,000	\$3,090,000	\$3,182,700	\$3,278,181	\$3,376,526	\$3,477,822	\$19,405,229

C.EN.101657 - AMTRAK NEC CONCRETE TIE REPLACEMENT Concrete tie replacement of non-effective concrete ties on the Northeast Corridor. This project is for replacement of the concrete ties without using the Track Laying machine.	FAST Act Category: - Normalized Replacement Also supports: - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency	Construction Program Priority: 13 Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
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Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101657 Total
\$8,930,000	\$9,197,900	\$9,473,837	\$9,758,052	\$10,050,794	\$10,352,317	\$57,762,900

C.EN.101713 - AMTRAK NEC INSULATED JOINT PROGRAM On-going program on the NEC for repair of insulated joints through the replacement of defective rail. Location: NEC wide.				FAST Act Category: - Normalized Replacement Also supports: - Normalized Capital Replacement - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101713 Total
\$3,300,000	\$3,399,000	\$3,500,970	\$3,605,999	\$3,714,179	\$3,825,604	\$21,345,752
C.EN.101277 - FAIR INTERLOCKING RENEWAL The Fair Interlocking Renewal Project includes building and replacing turnouts and crossovers in kind, within the limits of Fair Interlocking. Also performed under this Project is the removal of old ballast for the restoration of proper drainage along the tracks and right of way (ROW). Location: Linecode - AN, milepost 56.4. PRIIA segment 14.				FAST Act Category: - Normalized Replacement Also Supports: - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: 13 Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101277 Total
\$3,000,000	\$3,500,000	\$2,500,000	\$2,575,000	\$2,652,250	\$2,731,818	\$16,959,068

<p>C.EN.101711 - AMTRAK NEC FENCE UPGRADES</p> <p>Replacement of fencing that is not in a state of good repair. This program will address the current backlog of 480,000 linear feet system-wide and includes right of way, inner-track and security fencing.</p> <p>Location: NEC wide.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement <p>Also Supports:</p> <ul style="list-style-type: none"> - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency 	<p>Construction</p> <p>Program Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - SOGR - Journey Time Capability
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101711 Total
\$6,000,000	\$6,180,000	\$6,365,400	\$6,556,362	\$6,753,053	\$6,955,644	\$38,810,459

<p>C.EN.100755 - NY EAST RVR TUN RAIL/TIE LN1/2</p> <p>The ERT Project is a flexible project that is necessary for the rehabilitation tracks, ties and ballast within our tunnels, however it isn't scheduled into a specific timeframe due to its ability to be used to when a variety of conditions or opportunities arise. These include an opportune extended track outage, the need to cover a major work cancelation or when our Amtrak workforce has a gap in their work before moving to another project or maintenance related working task. Taking place between MP2.04 to MP2.12, this Project will replace 60 foot track panels, approximately 400 linear feet of rail and rail ties. These replacements are necessary due to the damp tunnel conditions and wear and corrosion due to a high volume area.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement <p>Also Supports:</p> <ul style="list-style-type: none"> - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency 	<p>Construction</p> <p>Program Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - SOGR - Journey Time Capability - Resilience
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Location: Line code - AT, milepost 2.04 to 2.12. East River Tunnel. PRIIA segment 10.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100755 Total
\$500,000	\$3,500,000	\$100,000	\$100,000	\$100,000	\$100,000	\$4,400,000

<p>C.EN.101727 - AMTRAK NEC CROSSING UPGRADES</p> <p>Upgrade of at grade-road-crossings on the NEC to include but not limited to rail, ties, timber, joint elimination, ballast, drainage improvements, and paved/crossing material surface.</p> <p>Location: NEC wide.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement <p>Also Supports:</p> <ul style="list-style-type: none"> - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency 	<p>Construction</p> <p>Program Priority: 12</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - Journey Time Capability - SOGR - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101727 Total
\$600,000	\$618,000	\$636,540	\$655,636	\$675,305	\$695,564	\$3,881,045

<p>C.EN.100739 - WAS-BOS RAIL LUBRICATOR REPLACE</p> <p>Rail - Install Rail Lubricators on the NEC main line to reduce rail wear on recently installed welded rail.</p> <p>Location: Linecode - AP. PRIIA segment 22.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement - Improvements to support service enhancement or growth <p>Also Supports:</p> <ul style="list-style-type: none"> - Strategic initiative that improves operational performance and efficiency 	<p>Construction</p> <p>Program Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - SOGR - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100739 Total
\$550,000	\$566,500	\$583,495	\$601,000	\$619,030	\$637,601	\$3,557,626

<p>C.EN.101653 - AMTRAK NEC WAYSIDE DETECTOR REPLACEMENT</p> <p>Install wheel impact detectors at various locations on the Northeast Corridor. The wheel impact detectors are designed to record train wheel defects. Development of a database, application and communications network for collecting and analyzing track based measurements from wayside systems and the development of interface tools for importing these measurements into an Advanced Metering Management system (AMM).</p> <p>Location: NEC wide.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement - Improvements to support service enhancements or growth 	<p>Construction</p> <p>Program Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Journey Time Capability - SOGR - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101653 Total
\$200,000	\$206,000	\$212,180	\$218,545	\$225,102	\$231,855	\$1,293,682

**C.EN.101648 - AMTRAK NEC CONCRETE TIE FASTENER
HDWARE**

Concrete Tie Fastener Hardware is an on-going program in the Northeast Corridor that funds the replacement of track fasteners currently not in a state of good repair. Typical work performed under this program includes the replacement of pandrol clips, worn pads and associated hardware that has exceeded its useful life.

Location: NEC wide.

FAST Act Category:
- Normalized Replacement

Also supports:
- Improvements to support service enhancements or growth
- Strategic initiative that improves operational performance and efficiency

Construction
Program Priority:
N/A

Project Benefits:
- Safety
- Journey Time
Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101648 Total
\$250,000	\$257,500	\$265,225	\$273,182	\$281,377	\$289,819	\$1,617,103

C.EN.100333 - TRACK - FUTURE DESIGN

This will support the Future Track Replacement, Curve Mods, Inter. Renewal Design effort on the entire Northeast Corridor & HBG Line.

Location: NEC Wide.

FAST Act Category:
- Normalized Replacement
- Strategic initiative that improves operational performance and efficiency

Construction
Program Priority:
N/A

Project Benefits:
- Safety
- Journey Time
Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100333 Total
\$350,000	\$350,000	\$350,000	\$350,000	\$350,000	\$350,000	\$2,100,000

C.EN.101794 - AMTRAK NEC - RAIL GRINDING

Grinding of newly installed continuously welded rail or switches along the NEC. Grinding of older rail and switches will remain in System's Track's core budget.

Location: NEC wide.

FAST Act Category:
- Improvements
- Strategic initiative that improves operational performance and efficiency

Construction
Program Priority:
N/A

Project Benefits:
- Journey Time
Capability
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101794 Total
\$100,000	\$103,000	\$106,090	\$109,273	\$112,551	\$115,927	\$646,841

<p>C.EN.101178 - CONCRETE TIE REDESIGN</p> <p>Total redesign of the concrete tie used in high speed track. This will include benchmarking current design, developing and evaluating alternate designs, producing prototypes, laboratory testing and installation in track most of the work will be carried out by engineering consultants familiar with concrete tie design.</p> <p>Location: NEC wide.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement - Strategic initiative that improves operational performance and efficiency 	<p>Construction</p> <p>Program Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - Journey Time Capability - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101178 Total
\$500,000	\$0	\$0	\$0	\$0	\$0	\$500,000

<p>C.EN.100756 - ERT LINE 3/4 RAIL/TIES</p> <p>The ERT Project is a flexible project that is necessary for the rehabilitation tracks, ties and ballast within our tunnels, however it isn't scheduled into a specific timeframe due to its ability to be used to when a variety of conditions or opportunities arise. These include an opportune extended track outage, the need to cover a major work cancelation or when our Amtrak workforce has a gap in their work before moving to another project or maintenance related working task. Taking place between MP2.04 to MP2.12, this Project will replace 60 foot track panels, approximately 400 linear feet of rail and rail ties. These replacements are necessary due to the damp tunnel conditions and wear and corrosion due to a high volume area.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement <p>Also Supports:</p> <ul style="list-style-type: none"> - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency 	<p>Construction</p> <p>Program Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - SOGR - Journey Time Capability - Resilience
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Location: Line code - AT, milepost 2.04 to 2.12. East River Tunnel. PRIIA segment 10.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100756 Total
\$500,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$1,000,000

<p>C.EN.100882 - PENN STATION NY BROOKFIELD OVERBUILD</p> <p>Track replacement along the NEC to address SOGR needs and backlog repair and to bring the track infrastructure into a SOGR, improving safety, reliability and operational performance. This work is being conducted in the Hudson yards area.</p> <p>Location: Linecode AZ/AN, milepost 7 (est.). PRIIA segment 12.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements - 	<p>Construction</p> <p>Program Priority: 6</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> -SOGR - Journey Time Capability
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100882 Total
\$5,100,000	\$0	\$0	\$0	\$0	\$0	\$5,100,000

<p>C.EN.101592 - TRENTON NJ INTERCHANGE EXTENSION</p> <p>The scope for Trenton, NJ Interchange Extension Project is to extend the existing interchange track at Trenton, NJ in order to accommodate additional ballast car unit trains. This includes construction of two storage tracks off of the existing #5 Running track at "Fair" Interlocking and installation of a new track #8.</p> <p>Location: Linecode - AN, milepost 56.4. PRIIA segment 14.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements - Strategic initiative that improves operational performance and efficiency 	<p>Construction</p> <p>Program Priority: 12</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - Journey Time Capability - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101592 Total
\$1,500,000	\$0	\$0	\$0	\$0	\$0	\$1,500,000

<p>C.EN.101646 - WESTSIDE CONNECTION TUNNEL TRACK UPGRS</p> <p>To analyse and replace the track infrastructure within the Empire Tunnel as the Empire Line leaves NYPS.</p> <p>Location: Line code - AT, milepost 0.56. North Access Tunnel. PRIIA segment 10.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement - Improvements to support service enhancement or growth <p>Also Supports:</p> <ul style="list-style-type: none"> - Normalized Capital Replacement - Backlog Capital Replacement - Strategic initiative that improves operational performance and efficiency 	<p>Construction</p> <p>Program Priority: 8</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - Journey Time Capability - SOGR - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101646 Total
\$5,000,000	\$0	\$0	\$0	\$0	\$0	\$5,000,000

C.EN.101724 - AMTRAK NEC SUPPORT FACILITIES TK REHAB NEC program to bring the maintenance of equipment (MOFE) facility assets to a SOGR. Examples of work performed under this program include tie replacement, turnout replacement, rail replacement, crossing replacement, and surfacing. Location: NEC wide.				FAST Act Category: - Normalized Replacement - Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience		
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101724 Total
\$9,000,000	\$5,000,000	\$5,150,000	\$5,304,500	\$5,463,635	\$5,627,544	\$35,545,679
C.EN.101774 - AMTRAK NEC TOTAL TRACK REPLACEMENT Track replacement along the NEC to address SOGR needs and backlog repair and to bring the track infrastructure into a SOGR, improving safety, reliability and operational performance. Location: NEC wide.				FAST Act Category: - Normalized Replacement Also supports: - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101774 Total
\$1,500,000	\$0	\$0	\$0	\$0	\$0	\$1,500,000
C.EN.101775 - PELAM BAY-MANOR INCREASE SPEED 45-60 MPH Design and possible future construction of section improvements between Pelham and Manor to improve the MAS from 45 mph to 60 mph. Location: Linecode - AG, milepost 15.73 to 18. PRIIA segment 8.				FAST Act Category: - Improvements - Strategic initiative that improves operational performance and efficiency - Improvements to support service enhancements or growth		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101775 Total
\$1,000,000	\$0	\$0	\$0	\$0	\$0	\$1,000,000

C.EN.201126 - BRANDY-RAGAN SEC IMPROVEMENT
 Design and construction for the modifications to existing Ragan, Brandy and Yard Interlocking. Ragan Phase I includes replacement of the 21 crossover, replacement of the 19 turnout, and replacement of the 23 crossover. Ragan Phase II includes replacement of the 12 and 32 crossovers. Installation of 1.5 miles of track including a new track #3 between Ragan and Yard Interlocking, removal of the 21 crossover and replacing the 91 crossover at Yard Interlocking. Replacing the 12B turnout at Brandy Interlocking and providing flagging protection and support of Delaware Transit Corporation's (DTC) contractor during replacement of the Mill Creek Bridge. Replacement of the Orange Street Bridge and providing flagging protection and support during reconstruction of the street below the bridge. Scope also includes modifications to Norfolk Southern's Shellpot Branch and Amtrak's Newport Secondary track.

FAST Act Category:
 - Normalized Replacement
 - Improvements to support service enhancements or growth

Also supports:
 - Normalized capital replacement
 - Backlog capital replacement

Construction
Program Priority:
 6

Project Benefits:
 - Safety
 - Journey Time
Capability
 - SOGR
 - Resilience

Location: Linecode - AP, milepost 29.7 (Ragan I/L), 26.9 (Brandy I/L) and 28.2 (Yard I/L). PRIIA segment 20.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.201126 Total
\$3,500,000	\$3,500,000	\$0	\$0	\$0	\$0	\$7,000,000

C.EN.101285 - PERRY INTERLOCKING TURNOUT RENEWALThe scope for the Perry Interlocking Renewal Project includes design and construction for the Perry Interlocking Replacement, which includes replacement of all turnouts at Perry Interlocking in the same footprint; removal old ballast and track; restoration of proper drainage; and installation of new track panels.Location: Linecode - AP, milepost 59.5. PRIIA segment 20.

FAST Act Category:-
 ImprovementsAlso
Supports:- Normalized
 Capital Replacement-
 Improvements to support
 service enhancement or
 growth- Strategic initiative
 that improves operational
 performance and efficiency

Construction
Program Priority:
 12Project
Benefits: - Safety-
 Journey Time
Capability- SOGR-
 Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101285 Total
\$5,000,000	\$0	\$0	\$0	\$0	\$0	\$5,000,000

C.EN.100411 - NEW BRUNSWICK-TRENTON NJHSRIP TRACK Track upgrades along a 23-mile section of track between Trenton and New Brunswick, New Jersey to support faster, more reliable and more frequent service for all NEC users. The project will overhaul track infrastructure providing modern infrastructure that will allow Acela services to reach 160 mph, their highest speed anywhere on the NEC. Location: Linecode - AN, milepost TBD. PRIIA segment 12.				FAST Act Category: - Major Backlog Also Supports: -Normalized Cap. Replacement -Improvements to Support Service Enhancements or growth -Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: N/A Project Benefits: -Journey Time Capability -SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100411 Total
\$600,000	\$0	\$0	\$0	\$0	\$0	\$600,000

C.EN.100679 - INRL SOUTH PENN INTERLOCKING - INTERLOCKING RENEWAL Interlocking renewal includes the replacement of the following as needed, but not limited to, turn-outs, rail, ties, sub-grade, ballast, components of the overhead catenary, signal transformers, signals cables, signal bridges, switch heater, switch machines, switch houses, instrument houses, and interlocking lighting. Location: Linecode - AP, milepost 1.5 PRIIA segment 17 and 18.				FAST Act Category: - Normalized Replacement Also Supports: - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100679 Total
\$0	\$2,500,000	\$0	\$0	\$0	\$0	\$2,500,000

<p>C.EN.101278 - INRL HOLLY INTERLOCKING - INTERLOCKING RENEWAL</p> <p>Interlocking renewal includes the replacement of the following as needed, but not limited to, turn-outs, rail, ties, sub-grade, ballast, components of the overhead catenary, signal transformers, signals cables, signal bridges, switch heater, switch machines, switch houses, instrument houses, and interlocking lighting.</p> <p>Location: Linecode - AP, milepost 20.3. PRIIA segment 20.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement <p>Also Supports:</p> <ul style="list-style-type: none"> - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency 	<p>Construction Program Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - Journey Time Capability - SOGR - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101278 Total
\$0	\$0	\$500,000	\$2,000,000	\$0	\$0	\$2,500,000

<p>C.EN.101288 - INRL DAVIS INTERLOCKING - INTERLOCKING RENEWAL</p> <p>Interlocking renewal includes the replacement of the following as needed, but not limited to, turn-outs, rail, ties, sub-grade, ballast, components of the overhead catenary, signal transformers, signals cables, signal bridges, switch heater, switch machines, switch houses, instrument houses, and interlocking lighting.</p> <p>Location: Linecode - AP, milepost 38.4. PRIIA segment 20.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement <p>Also Supports:</p> <ul style="list-style-type: none"> - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency 	<p>Construction Program Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - Journey Time Capability - SOGR - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101288 Total
\$0	\$0	\$20,000,000	\$10,000,000	\$15,000,000	\$35,000,000	\$80,000,000

C.EN.101301 - TURN GROVE INTERLOCKING - TURNOUT RENEWAL Replacement of Grove interlocking turnouts, removal of old ballast and track, to restore proper drainage. New track panels are also installed under this Program, returning the asset to SOGR. Location: Linecode - AP, milepost 112.4. PRIIA segment 22.				FAST Act Category: - Normalized Replacement Also Supports: - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101301 Total
\$0	\$500,000	\$1,000,000	\$4,000,000	\$0	\$0	\$5,500,000
C.EN.101308 - INRL HAM INTERLOCKING - INTERLOCKING RENEWAL Interlocking renewal includes the replacement of the following as needed, but not limited to, turn-outs, rail, ties, sub-grade, ballast, components of the overhead catenary, signal transformers, signals cables, signal bridges, switch heater, switch machines, switch houses, instrument houses, and interlocking lighting. Location: Linecode - AN, milepost 55.7. PRIIA segment 12.				FAST Act Category: - Improvements Also Supports: - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101308 Total
\$0	\$3,000,000	\$3,090,000	\$3,182,700	\$3,278,181	\$3,376,526	\$15,927,407

C.EN.101502 - INRL LINCOLN INTERLOCKING - INTERLOCKING RENEWAL Interlocking renewal includes the replacement of the following as needed, but not limited to, turn-outs, rail, ties, sub-grade, ballast, components of the overhead catenary, signal transformers, signals cables, signal bridges, switch heater, switch machines, switch houses, instrument houses, and interlocking lighting. Location: Linecode - AN, milepost 26. PRIIA segment 12.				FAST Act Category: - Improvements Also Supports: - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101502 Total
\$-	\$500,000	\$1,000,000	\$15,000,000	\$15,000,000	\$-	\$31,500,000
C.EN.101717 - MOFE PENN COACH YARD - INSPECTION PIT/FUELING TK UPGR Upgrade to the MofE inspection pit and fueling track structures at Penn Coach Yard. Project will address SOGR backlog. Location: Linecode - AP. PRIIA segment 23.				FAST Act Category: - Facilities -		Construction Program Priority: 10 Project Benefits: - Safety
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101717 Total
\$0	\$2,000,000	\$0	\$0	\$0	\$0	\$2,000,000
C.EN.101778 - INRL PRINCE INTERLOCKING - INTERLOCKING RENEWAL Interlocking renewal includes the replacement of the following as needed, but not limited to, turn-outs, rail, ties, sub-grade, ballast, components of the overhead catenary, signal transformers, signals cables, signal bridges, switch heater, switch machines, switch houses, instrument houses, and interlocking lighting. Location: Linecode - AP, milepost 57.3. PRIIA segment 21.				FAST Act Category: - Normalized Replacement Also Supports: - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101778 Total
\$0	\$2,000,000	\$0	\$0	\$0	\$0	\$2,000,000

Track Capital Program – NEC Branch Line

C.EN.101668 - AMTRAK NATIONAL SURFACING PROGRAM
Surfacing Program performs high speed surfacing on the tracks throughout the Harrisburg Line. This is a flexible Program that is continually changing. Due to it's ability to be flexible, it takes the least priority when other Track assignments need to be placed ahead. The National Track Surfacing Program is also subject to change due to factors such as weather, the availability of track outages and changes in the schedule of the SES, Undercutter and TLS.

Location: Linecode - AH (Harrisburg Line). PRIIA segments 28,29 and 30.

FAST Act Category:
- Normalized Replacement

Also supports:
- Improvements to support service enhancements or growth
- Strategic initiative that improves operational performance and efficiency

Construction Program
Priority:
13

Project Benefits:
- Safety
- Journey Time Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101668 Total
\$3,500,000	\$3,605,000	\$3,713,150	\$3,824,545	\$3,939,281	\$4,057,459	\$22,639,435

C.EN.101734 - ALBANY LINE - DRAINAGE-ROADBED IMPROVEME
This project covers drainage improvements along the Albany Line. This work includes, but is not limited to: Vacuum Train, Badger Ditcher/Gradall, Slot Train, Shoulder Cleaner, Slope Stabilization, and Drainage Improvements.

Location: Line code - AR, milepost TBD. No PRIIA Segment.

FAST Act Category:
- Normalized Replacement

Also Supports:
- Strategic initiative that improves operational performance and efficiency
- Improvements to support service enhancements or growth

Construction Program
Priority:
14

Project Benefits:
- SOGR
- Journey Time Capability
- Environmental
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101734 Total
\$3,300,000	\$3,399,000	\$3,500,970	\$3,605,999	\$3,714,179	\$3,825,604	\$21,345,752

<p>C.EN.101730 - ALBANY LINE - TURNOUT RENEWAL Turnout renewals on the Albany Line - including removal of old ballast and track, to restore proper drainage. New track panels are also installed under this Program, returning the asset to SOGR.</p> <p>Location: Line code - AR, milepost TBD. No PRIIA Segment.</p>	<p>FAST Act Category: - Normalized Replacement</p> <p>Also Supports: - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency</p>	<p>Construction Program Priority: 12</p> <p>Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience</p>
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101730 Total
\$1,550,000	\$1,596,500	\$1,644,395	\$1,693,727	\$1,744,539	\$1,796,875	\$10,026,036

<p>C.EN.101669 - AMTRAK NATIONAL DRAINAGE-ROADBED PROGRAM Implementation of drainage improvements including - Vacuum Train, Badger Ditcher/Gradall, Slot Train, Shoulder Cleaner, Slope Stabilization, and Drainage Improvements.</p> <p>Location: Linecode - AH (Harrisburg Line), milepost TBD. PRIIA segment 28,29 and 30.</p>	<p>FAST Act Category: - Normalized Replacement</p> <p>Also Supports: - Strategic initiative that improves operational performance and efficiency - Normalized Capital Replacement</p>	<p>Construction Program Priority: N/A</p> <p>Project Benefits: - SOGR - Journey Time Capability - Environmental - Resilience</p>
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101669 Total
\$6,000,000	\$4,500,000	\$3,500,000	\$3,500,000	\$3,500,000	\$3,500,000	\$24,500,000

C.EN.101672 - AMTRAK NATIONAL JOINT ELIMINATION PRGM
 On-going program in the Springfield/Harrisburg (National) to eliminate rail joints. These rail joints are created by base corroded rail change outs, Sperry car change outs, surface bent rail, engine burns, defective welds, project related, and other rail defects.

Location: Linecode - AS (Springfield Line). PRIIA segment 25.
 AND
 Linecode - AH (Harrisburg Line). PRIIA segments 28,29 and 30.

FAST Act Category:
 - Normalized Replacement

Also Supports:
 - Strategic initiative that improves operational performance and efficiency
 - Improvements to support service enhancements or growth

Construction Program
Priority:
 12

Project Benefits:
 - Journey Time Capability
 - Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101672 Total
\$1,150,000	\$1,184,500	\$1,220,035	\$1,256,636	\$1,294,335	\$1,333,165	\$7,438,671

C.EN.101667 - AMTRAK NATIONAL SPOT UNDERCUTTING PRGM
 Perform spot undercutting and/or rail vacuuming maintenance with 3rd party Rail Vacs (Loram) or Vac Trucks in locations determined by System Track and Division Maintenance groups to remove mud spot locations along the AH and AS Lines.

Location: Linecode - AS (Springfield Line). PRIIA segment 25.
 AND
 Linecode - AH (Harrisburg Line). PRIIA segments 28,29 and 30.

FAST Act Category:
 - Improvements

Also supports:
 - Improvements to support service enhancements or growth
 - Strategic initiative that improves operational performance and efficiency

Construction Program
Priority:
 13

Project Benefits:
 - Safety
 - Journey Time Capability
 - SOGR
 - Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101667 Total
\$1,500,000	\$1,545,000	\$1,591,350	\$1,639,091	\$1,688,263	\$1,738,911	\$9,702,615

C.EN.101594 - ALBANY LINE JOINT ELIMINATION

Joint Elimination is an on-going program in the Albany area that funds the elimination of rail joints. These rail joints are created by base corroded rail change outs, Sperry car change outs, surface bent rail, engine burns, defective welds, project related, and other rail defects.

Location: Line code - AR, milepost TBD. No PRIIA Segment.

FAST Act Category:

- Improvements

Also Supports:

- Strategic initiative that improves operational performance and efficiency
- Improvements to support service enhancements or growth

Construction

Program

Priority:

12

Project Benefits:

- Journey Time
Capability
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101594 Total
\$530,000	\$545,900	\$562,277	\$579,145	\$596,520	\$614,415	\$3,428,257

C.EN.101777 - SPRING INTERLOCKING RENEWAL

Interlocking renewal includes the replacement of the following as needed, but not limited to, turn-outs, rail, ties, sub-grade, ballast, components of the overhead catenary, signal transformers, signals cables, signal bridges, switch heater, switch machines, switch houses, instrument houses, and interlocking lighting.

Location: Linecode - AS, milepost 62. PRIIA segment 25.

FAST Act Category:

- Improvements

Also Supports:

- Normalized Capital Replacement
- Improvements to support service enhancement or growth
- Strategic initiative that improves operational performance and efficiency

Construction

Program

Priority:

N/A

Project Benefits:

- Safety
- Journey Time
Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101777 Total
\$10,250,000	\$1,000,000	\$0	\$0	\$0	\$0	\$11,250,000

C.EN.100302 - ALBANY LN INSULATED JNT RENEW On-going program on the NEC for repair of insulated joints through the replacement of defective rail. Location: Line code - AR, milepost TBD. No PRIIA Segment.				FAST Act Category: - Improvements Also Supports: - Strategic initiative that improves operational performance and efficiency - Improvements to support service enhancements or growth		Construction Program Priority: 12 Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100302 Total
\$300,000	\$309,000	\$318,270	\$327,818	\$337,653	\$347,782	\$1,940,523

C.EN.101266 - EMPIRE CORR - ROW FENCING REPLACEMENT Installation of security and safety fencing on the Empire Corridor both at locations with no fence and replacing existing fence that has exceeded its useful life. Location: Line code - AR, milepost TBD. No PRIIA Segment.				FAST Act Category: - Improvements Also Supports: - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: -SOGR - Journey Time Capability
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101266 Total
\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$6,000,000

Track Capital Program – National Network

C.EN.100799 - CENTRAL DIV TK REHABILITATION
Rehabilitation of track infrastructure in the Central Division
- including tie replacement, turnout replacement, rail
replacement, crossing replacement, and surfacing.

Location: National Network - Central Division.

FAST Act Category:
- Improvements

Also supports:
- Normalized Capital
Replacement

Construction
Program
Priority:
13

Project Benefits:
- SOGR
- Journey Time
Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100799 Total
\$7,000,000	\$6,850,000	\$7,055,500	\$7,267,165	\$7,485,180	\$7,709,735	\$43,367,580

C.EN.101675 - AMTRAK NATIONAL TURNOUT RENEWAL
PROGRAM
National Network Turnout Renewal Program replaces
wayside and interlocking turnouts, removes the old ballast
and track, helping to restore proper drainage. New track
panels are also installed under this Program.

Location: National Network.

FAST Act Category:
- Normalized Replacement

-

Construction
Program
Priority:
13

Project Benefits:
- Safety
- Journey Time
Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101675 Total
\$10,200,000	\$10,506,000	\$10,821,180	\$11,145,815	\$11,480,190	\$11,824,596	\$65,977,781

C.EN.101673 - AMTRAK NATIONAL TIE-TIMBER PROGRAM
The National Tie/Timber Replacement Program replaces
wood ties and timbers along the mainline, siding and yard
tracks of the railroad. These ties are replaced due to
diminished ability to hold their gage (distance between the
track), due to continued use, loss of strength and increased
age.

Location: National Network.

FAST Act Category:
- Normalized Replacement

Also supports:
- Improvements to support
service enhancements or
growth

Construction
Program
Priority:
13

Project Benefits:
- Safety
- Journey Time
Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101673 Total
\$5,500,000	\$5,665,000	\$5,834,950	\$6,009,999	\$6,190,298	\$6,376,007	\$35,576,254

C.EN.100654 - TIES CENTRAL DIVISION - WOOD TIE PROGRAM Programmed replacement of deteriorating wood tie stretches on the Central Division, including surfacing. Location: National Network - Central Division.				FAST Act Category: - Improvements Also supports: - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: 14 Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100654 Total
\$750,000	\$772,500	\$795,675	\$6,300,000	\$6,489,000	\$6,683,670	\$21,790,845
C.EN.100377 - WEST DIVISION - STATION TRACK Track upgrades to various station tracks on the western division. These upgrades include but are not limited to ties, rail, or turnouts. Location: National Network - Western Division.				FAST Act Category: - Improvements Also Supports: - Normalized Capital Replacement - Improvements to support service enhancement or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: 13 Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100377 Total
\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$15,000,000
C.EN.101720 - AMTRAK NATIONAL RAIL REPLACEMENT PROGRAM National Network program for rail replacement of worn rail on the mainline, siding, and yard tracks. Location: National Network.				FAST Act Category: - Normalized Replacement Also supports: - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101720 Total
\$2,000,000	\$500,000	\$515,000	\$530,450	\$546,364	\$562,754	\$4,654,568

C.EN.101674 - AMTRAK NATIONAL INTERLOCKING STL PROGRAM
National Network program for the renewal of interlocking steel components. This work includes insulated joints, switch points, stock rails, and frogs.

Location: National Network.

FAST Act Category:
- Normalized Replacement
-

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- Journey Time Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101674 Total
\$825,000	\$849,750	\$875,243	\$901,500	\$928,545	\$956,401	\$5,336,439

C.EN.101723 - AMTRAK NATIONAL RIDE QUALITY IMPROV
Ride Quality Improvement Program is an ongoing program to diminish the "rough spots" along the right of way on Amtrak's National Network.

Location: National Network.

FAST Act Category:
- Improvements
- Improvements to support service enhancements or growth

Construction Program
Priority:
13

Project Benefits:
- Journey Time Capability
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101723 Total
\$2,000,000	\$2,060,000	\$2,121,800	\$2,185,454	\$2,251,018	\$2,318,548	\$12,936,820

C.EN.100495 - GEOM CENTRAL DIVISION-SURFACING PROGRA
High speed surfacing gang surface 30 track miles with Dnya-CAT Tamper to Class 6 standards.

Location: National Network - Central Division.

FAST Act Category:
- Improvements

Also supports:
- Improvements to support service enhancements or growth
- Strategic initiative that improves operational performance and efficiency

Construction Program
Priority:
13

Project Benefits:
- Safety
- Journey Time Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100495 Total
\$750,000	\$6,300,000	\$750,000	\$772,500	\$795,675	\$819,545	\$10,187,220

C.EN.101722 - AMTRAK NATIONAL INSULATED JT REPLACEMENT National Network program for the renewal of insulated joints used in the track signal circuit system. The insulated joints to be replaced are in the open track and in interlockings. Location: National Network.				FAST Act Category: - Normalized Replacement Also Supports: - Strategic initiative that improves operational performance and efficiency - Improvements to support service enhancements or growth		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101722 Total
\$515,000	\$530,450	\$546,364	\$562,754	\$579,637	\$597,026	\$3,331,231
C.EN.101710 - AMTRAK NATIONAL FENCE UPGRADES Replacement of fencing that is not in a state of good repair. This program will address the current backlog of 480,000 linear feet system-wide and includes right of way, inner-track and security fencing. Location: National Network.				FAST Act Category: - Improvements -		Construction Program Priority: N/A Project Benefits: -SOGR - Journey Time Capability
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101710 Total
\$1,000,000	\$1,030,000	\$1,060,900	\$1,092,727	\$1,125,509	\$1,159,274	\$6,468,410
C.EN.100750 - AMTK SY SURFACING PRG DEVELOP Develop scope of programs and schedule system and division surfacing resources. Location: National Network.				FAST Act Category: - Normalized Replacement -		Construction Program Priority: N/A Project Benefits: -SOGR - Journey Time Capability
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100750 Total
\$370,000	\$0	\$0	\$0	\$0	\$0	\$370,000

C.EN.100966 - TKAP CENTRAL DIVISION - RAIL LUBRICATOR Rail - Install Rail Lubricators on the Central Division to reduce rail wear on recently installed welded rail. Location: National Network - Central Division.				FAST Act Category: - Improvements - Improvements to support service enhancement or growth Also Supports: - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: 9 Project Benefits: - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100966 Total
\$110,000	\$113,300	\$116,699	\$120,200	\$123,806	\$127,520	\$711,525
C.EN.101749 - CENTRAL DIV DRAINAGE-ROADBED IMPROVMNTS This project covers drainage improvements across the central division. This work includes, but is not limited to: Vacuum Train, Badger Ditcher/Gradall, Slot Train, Shoulder Cleaner, Slope Stabilization, and Drainage Improvements. Location: National Network - Central Division.				FAST Act Category: - Improvements Also Supports: - Improvements to support service enhancements or growth		Construction Program Priority: 12 Project Benefits: - SOGR - Journey Time Capability - Environmental - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101749 Total
\$400,000	\$412,000	\$424,360	\$437,091	\$450,204	\$463,710	\$2,587,365
C.EN.100986 - CENTRAL DIV-SECURITY FENCE INSTALLATIONS Installation of security and safety fencing at various locations throughout the central division including: Sanford, FL; New Orleans; and various sites in Michigan. Location: National Network - Central Division.				FAST Act Category: - Improvements - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: -SOGR - Journey Time Capability
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100986 Total
\$3,100,000	\$3,193,000	\$3,288,790	\$3,387,454	\$3,489,077	\$3,593,750	\$20,052,071

C.EN.101719 - AMTRAK NATIONAL CONCRETE TIE FASTENER HD National Network program for the replacement of track fasteners currently not in a SOGR. Typical work performed under this program includes the replacement of pandrol clips, worn pads and associated hardware that has exceeded its useful life. Location: National Network.				FAST Act Category: - Normalized Replacement Also supports: - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101719 Total
\$50,000	\$51,500	\$53,045	\$54,636	\$56,275	\$57,964	\$323,420
C.EN.101776 - CENTRAL DIVISION - JOINT ELIMINATION Joint elimination in the Central Division to improve ride quality and train safety. Location: National Network - Central Division.				FAST Act Category: - Improvements Also supports: - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101776 Total
\$200,000	\$0	\$0	\$0	\$0	\$0	\$200,000
C.EN.100764 - AMTRAK NATIONAL CROSSING UPGRADES The scope of this National project is to upgrade the at grade road crossings to include but not limited to rail, ties, timber, joint elimination, ballast, drainage improvements, and paved/crossing material surface. Location: National Network.				FAST Act Category: - Normalized Replacement Also supports: - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: 12 Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100764 Total
\$950,000	\$978,500	\$1,007,855	\$1,038,091	\$1,069,233	\$1,101,310	\$6,144,989

C.EN.101725 - TKRH AMTRAK NATIONAL - SUPPORT FACILITIES TK REHABILITATION National Network program to bring the maintenance of equipment (MOFE) facility assets to a SOGR. Examples of work performed under this program include tie replacement, turnout replacement, rail replacement, crossing replacement, and surfacing. Location: National Network.				FAST Act Category: - Normalized Replacement -	Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience	
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101725 Total
\$0	\$500,000	\$515,000	\$530,450	\$546,364	\$562,754	\$2,654,568

Track Capital Program – New York State

C.EN.100996 - ALBANY LINE - TIMBER PROGRAM The project funds the on going wood tie and timber replacement program on the Albany Line in the state of New York. Location: Line code - AR, milepost TBD. No PRIIA Segment.				FAST Act Category: - Improvements Also supports: - Improvements to support service enhancements or growth - Strategic initiative that improves operational performance and efficiency		Construction Program Priority: 9 Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100996 Total
\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$6,000,000

C.EN.100872 - ALBANY LINE CURVE & TRAIL TK RAIL REPL				FAST Act Category:	Construction	
Track replacement on the Albany line to address SOGR				- Improvements	Program	
needs and backlog repair and to bring the track				-	Priority:	
infrastructure into a SOGR, improving safety, reliability and					12	
operational performance.						
Location: Line code - AR, milepost TBD. No PRIIA Segment.					Project Benefits:	
					-SOGR	
					- Journey Time	
					Capability	
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100872
						Total
\$3,600,000	\$3,600,000	\$250,000	\$257,500	\$265,225	\$273,182	\$8,245,907

Track Capital Program – Michigan

C.EN.100345 - MICHIGAN LN REPL XING PANNELS
RENEW RAIL - Replace ties, ballast and crossing surface material in Michigan District.

Location: Linecode - AM, milepost TBD.

FAST Act Category:

- Improvements

Also Supports:

- Strategic initiative that improves operational performance and efficiency

Also Supports:

- Statutory, regulatory or other legal mandates

Construction

Program

Priority:

12

Project Benefits:

- Safety

- SOGR

- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100345 Total
\$451,147	\$464,681	\$478,622	\$492,981	\$507,770	\$523,003	\$2,918,204

C.EN.101545 - MICHIGAN LINE WEST RAIL RENEWAL
Replace worn rail on the west end of the state of Michigan with CWR to increase ride quality and train safety.

Location: National Network - State of Michigan.

FAST Act Category:

- Improvements

-

Construction

Program

Priority:

12

Project Benefits:

- Safety

- Journey Time

Capability

- SOGR

- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101545 Total
\$7,200,000	\$7,600,000	\$7,828,000	\$265,000	\$272,950	\$281,139	\$23,447,089

Track Capital Program – Significant Projects

C.EN.100201 - LANDOVER/HANSON I/L RENEWAL

The project includes design and construction of a new Hanson interlocking at MP128.4 and modifying the existing Landover Interlocking on MP128.6. Major elements of the project include: Building an access road for accessibility to HANSON interlocking to the east of the tracks, installation of four new crossovers, track adjustment including: raising the track, undercutting and/or shifting the track, 60 cycle power and new interlocking power, new electric switches with heaters, new signals with two new signal bridges (one northbound and one southbound), wayside Interface Units for ACSES and I-ETMS systems, new fiber optic cable for modified communications to CETC and PTC, new redundant signal power feed and new overhead catenary infrastructure including: new poles, trolley feeders, switch heater sub-stations and distribution panels. Additional work to be completed for this project is the removal of three existing crossovers (#12, #23, and #32) and modification of the 91 switch at Landover Interlocking, removal of signals, associated cables, modifying CETC, ACSES and PTC for the interlocking at Landover Interlocking and demolish the existing Landover Tower.

FAST Act Category:

- Improvements

Also Supports:

- Normalized Capital

Replacement

- Backlog Capital

Replacement

- Strategic initiative that improves operational performance and efficiency

Construction

Program Priority:

12

Project Benefits:

- Safety

- Journey Time

Capability

- SOGR

- Resilience

Location: Linecode - AP, milepost 128.4. PRIIA segment 20.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100201 Total
\$26,600,000	\$41,200,000	\$25,000,000	\$-	\$-	\$-	\$92,800,000

C.EN.101309 - MYSTIC CT(LORDS) NEW I/L CONSTRUCTION Construction of an new interlocking that splits an 18-mile block between Groton interlocking and High Street interlocking. This will facilitate track outages to increase Engineering work efficiency and provide Engineering a location to test the new advanced technology 60mph turnout design. Location: Linecode - AB, milepost 124.2(Groton I/L) to 142.9 (High Street I/L). PRIIA segment 4.				FAST Act Category: - Improvements - Strategic initiative that improves operational performance and efficiency - Improvements to support service enhancement or growth	Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - Resilience	
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101309 Total
\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$400,000	\$0	\$4,400,000

Track Capital Program – Other Departments						
<p>C.EV.100032 - PENN STATION - TRACK REMEDIATION</p> <p>Track remediation work at Penn Station to remove contaminated ballast and restore proper drainage along the tracks and right of way (ROW).</p> <p>Location: Linecodes - AT, AE, AZ and AN. Penn Station, NY. PRIIA segments 10,11,12 and 27.</p>				<p>FAST Act Category:</p> <ul style="list-style-type: none">- Environmental Remediation		<p>Construction</p> <p>Program Priority: N/A</p>
				<p>Also Supports:</p> <ul style="list-style-type: none">- Normalized Capital Replacement- Improvements to support service enhancement or growth- Strategic initiative that improves operational performance and efficiency		<p>Project Benefits:</p> <ul style="list-style-type: none">- Safety- Resilience- SOGR
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100032 Total
\$5,250,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$20,250,000

C.EV.100020 - FAIR INTERLOCKING CONTAMINATED SOIL RMVL

FAST Act Category:
- Environmental Remediation

Construction
Program Priority:
N/A

Location: Linecode - AN, milepost 56.4. PRIIA segment 14.

Project Benefits:
- Safety
- Resilience
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100020 Total
\$200,000	\$200,000	\$100,000	\$100,000	\$100,000	\$100,000	\$800,000

C.SP.100017 - Bal-Was Tk 1 UPGR-Additional HSR Trains

Upgrade 30 miles of existing Track 1 in Maryland and make associated signal system and track upgrades for higher speed operations on the Washington-to-Baltimore section of the NEC. Justification: This section of the NEC operates at or near capacity today and is not able to reliably absorb increases in service without additional infrastructure improvements. This project targets reductions in congestion-related delays and provides new overtake capacity between different classes of service (high-speed, conventional, and commuter), allowing the faster, high-speed trains to pass slower trains. These improvements, along with structural and operational changes, optimize use of this infrastructure and provide the necessary capacity to meet the Service Plan requirements.

FAST Act Category:
- Improvements

Construction
Program Priority:
N/A

Also Supports:
-Normalized Cap. Replacement
-Improvements to Support Service Enhancements or growth
-Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Project Benefits:
- Journey Time Capability
- Resilience

Location: Linecode - AP, milepost 129 to 98 (estimated). PRIIA segment 22.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.SP.100017 Total
\$0	\$0	\$0	\$0	\$0	\$0	\$0

C.TR.100076 - SOUTHWEST CHIEF JANSEN-LAMY TRACK IMPROV

Track Improvements to address SOGR needs on the Southwest Chief route. The route is unique in that the infrastructure owned by BNSF is solely used by Amtrak. Full maintenance costs of this section therefore fall to Amtrak.

Location: National Network. Jansen, CO to Lamy, NM.

FAST Act Category:

- Normalized Replacement

Also Supports:

- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction

Program Priority:
N/A

Project Benefits:

- Journey Time Capability
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.TR.100076 Total
\$6,775,179	\$8,057,066	\$8,982,882	\$9,351,279	\$10,767,399	\$11,693,216	\$55,627,021

Bridges and Buildings – FY19 to FY24 Constrained Capital Program

Bridges and Buildings Capital Program – NEC Main Line

C.EN.101697 - AMTRAK NEC UNDERGRADE BRIDGE UPGRADES

Program to bring Amtrak's NEC under-grade bridges to a SOGR. Some of the bridges will be brought to a SOGR through selective component replacement while others require complete replacement of movable structure, mechanical and electrical systems.

Location: NEC wide.

FAST Act Category:
- Normalized Replacement

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101697 Total
\$4,000,000	\$7,500,000	\$7,500,000	\$7,500,000	\$7,500,000	\$7,500,000	\$41,500,000

C.EN.101696 - AMTRAK NEC BRIDGE TIMBER REPLACEMENT

Replacement of bridge timbers along the NEC. Replacement of aging and deteriorated timbers will address SOGR needs, improve safety, efficiency and operational reliability.

Location: NEC wide.

FAST Act Category:
- Normalized Replacement

Construction Program
Priority:
15

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101696 Total
\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$30,000,000

C.EN.101698 - AMTRAK NEC CULVERT UPGRADES

Improvement to culverts on the NEC to address SOGR and backlog repair. Projects includes rehabilitation through to complete replacement. The program will progress assets to SOGR and improve network resilience.

Location: NEC wide.

FAST Act Category:
- Normalized Replacement

Also Supports:
- Backlog Capital Replacement

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101698 Total
\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$18,000,000

C.EN.101707 - AMTRAK NEC RETAINING WALL UPGRADES
Rehabilitation or replacement of retaining walls to address SOGR needs and backlog repair. Projects will improve safety and reliability.

Location: Linecodes - AN and AP, mileposts TBD. PRIIA segment 12 and 20.

FAST Act Category:
- Normalized Replacement

Also Supports:
- Improvements to Support Service Enhancements or growth

Construction Program Priority:
N/A

Project Benefits:
- Safety
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101707 Total
\$1,000,000	\$1,500,000	\$1,500,000	\$2,000,000	\$2,000,000	\$2,000,000	\$10,000,000

C.EN.101706 - AMTRAK NEC SIGNAL BRIDGE UPGRADES
The scope of this NEC program is to redeck the signal bridges and install fall protection equipment, including tie offs and safety lines on signals bridges.

Location: NEC wide.

FAST Act Category:
- Normalized Replacement
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program Priority:
N/A

Project Benefits:
- Safety
- Journey Time Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101706 Total
\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$15,000,000

C.EN.100477 - BRG/TUNNEL/WALL FUTURE DESIGN
Design of overhead bridges, signal bridges, undergrade bridges, culverts, tunnels, walls and other structures.

Location: NEC Wide.

FAST Act Category:
- Normalized Replacement

Construction Program Priority:
N/A

Project Benefits:
- Safety
- Journey Time Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100477 Total
\$1,250,000	\$0	\$0	\$0	\$0	\$0	\$1,250,000

C.EN.101622 - NORTH RIVER TUNNELS IMPROVEMENTS
Improvements to the North River Tunnels to address urgent SOGR needs and backlog repair. Project includes component replacement and rehabilitation to maintain safe operation and to maintain reliability.

Location: Line code - AZ, milepost 1.68. North River Tunnel. PRIIA segment 12.

FAST Act Category:
- Normalized Replacement

Construction Program
Priority:
13

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101622 Total
\$1,150,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$6,150,000

C.EN.101705 - AMTRAK NEC MOVABLE BRIDGE UPGRADES
Program to bring Amtrak's movable bridges to a SOGR. Some of the bridges will be brought to a SOGR through selective component replacement while others require complete replacement of movable structure, mechanical and electrical systems.

Location: NEC wide.

FAST Act Category:
- Normalized Replacement

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- Journey Time Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101705 Total
\$750,000	\$7,000,000	\$750,000	\$750,000	\$750,000	\$750,000	\$10,750,000

C.EN.101624 - EAST RIVER TUNNELS IMPROVEMENTS
Improvements to the East River Tunnels to address urgent SOGR needs and backlog repair. Project includes component replacement and rehabilitation to maintain safe operation and to maintain reliability.

Location: Line code - AT, milepost 1.44. East River Tunnel. PRIIA segment 10.

FAST Act Category:
- Normalized Replacement

Construction Program
Priority:
13

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101624 Total
\$750,000	\$1,500,000	\$1,500,000	\$1,500,000	\$1,500,000	\$1,500,000	\$8,250,000

C.EN.101244 - MID-ATLANTIC DIVISION TUNNEL UPGRADES				FAST Act Category: - Normalized Replacement		Construction Program
Improvements to the tunnels within the Mid-Atlantic division to address SOGR needs and backlog repair. Project includes component replacement to maintain reliability.				FAST Act Categories: - Normalized Capital Replacement		Priority: 12
Location: Linecode - AH, milepost 2.68. NY - Pittsburgh Tunnel. PRIIA segment 29.				Project Benefits: - SOGR - Safety - Resilience		
AND						
Linecode - AH, milepost 34.04. Conrail Tunnel. PRIIA segment 29.						
AND						
Linecode - AP, milepost 94.93. New Union Tunnel. PRIIA segment 22.						
AND						
Linecode - AP, milepost 94.94. Old Union Tunnel. PRIIA segment 22.						
AND						
Linecode - AP, milepost 96.11. John St Tunnel. PRIIA segment 22.						
AND						
Linecode - AP, milepost 96.60. Wilson St Tunnel. PRIIA segment 22.						
AND						
Linecode - AP, milepost 97.22. Gilmore St Tunnel. PRIIA segment 22.						
AND						
Linecode - AP, milepost 136.62. First St. Tunnel. PRIIA segment 24.						
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101244 Total
\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$6,000,000

C.EN.100371 - ENG EMPLOYEE ARC FLASH PROTECT
The National Fire Protection Association (NFPA) 70 E Standard for electrical safety in work place calls for an Arc Flash Hazard Analysis for employees working while exposed to electrical hazards. Amtrak is undertaking an electrical hazard analysis and arc flash analysis of its facilities. The work will take place in phases over several years by geographical grouping of facilities.

FAST Act Category:
- Safety & Mandates
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- Resilience

The scope of work includes validation and updating of electrical single line diagrams, electrical system capacity analysis, identification of electrical code violations, recommendations for system improvements to address capacity, arc flash mitigation, labeling of equipment and training of electrical workers and more.

Location: NEC Wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100371 Total
\$800,000	\$800,000	\$800,000	\$0	\$0	\$0	\$2,400,000

C.EN.100940 - NY DIV-INTRLOCKING LIGHTING FIXTURE UPR
Upgrade to lighting fixtures at interlockings across the New York Division

FAST Act Category:
- Normalized Replacement

Construction Program
Priority:
N/A

Location: NEC Main Line - New York Division.

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100940 Total
\$250,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$2,750,000

C.EN.101110 - STRUCTURES - BRIDGE TIE DESIGN Design of replacement Bridge Ties. Location: NEC Wide.				FAST Act Category: - Normalized Replacement FAST Act Categories: -Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: N/A Project Benefits: - Journey Time Capability - Resilience - SOGR
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101110 Total
\$100,000	\$0	\$0	\$0	\$0	\$0	\$100,000
C.EN.100203 - MAD SOUTH I/L LIGHTING UPGR Improve the safety, security and overall energy usage at various interlockings throughout the Mid-Atlantic Division by replacing and/or adding energy efficient light fixtures to the interlockings. Location: Linecode - AP, milepost TBD. PRIIA segment 20.				FAST Act Category: - Normalized Replacement -		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100203 Total
\$350,000	\$350,000	\$350,000	\$350,000	\$350,000	\$350,000	\$2,100,000
C.EN.100422 - MOVABLE BRG COMPONENT DSN Design of structures movable bridge components. Location: NEC Wide.				FAST Act Category: - Normalized Replacement		Construction Program Priority: N/A Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100422 Total
\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$1,200,000

<p>C.EN.100408 - NEW BRUNSWICK-TRENTON NJHSRIP BRIDGES</p> <p>Upgrade of right-of-way structures to support more frequent high-speed rail service and to improve the reliability of current service between New York and Washington. Amtrak is upgrading structures to support faster, more reliable and more frequent service for all NEC users. Modern infrastructure will allow Acela services to reach 160 mph, their highest speed anywhere on the NEC.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Major Backlog - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: 10</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Journey Time Capability - Resilience - SOGR
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Location: Linecode - AN, milepost TBD. PRIIA segment 12.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100408 Total
\$1,938,000	\$406,847	\$0	\$0	\$0	\$0	\$2,344,847

<p>C.EN.101513 - LEVITTOWN PA SUPPORT SEPTA STATION CONST</p> <p>Construction support services at the Levittown, PA train station. This work is in conjunction with SEPTA station improvements.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - Resilience - SOGR
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Location: Linecode - AN, milepost 63.1. PRIIA segment 14.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101513 Total
\$1,000,000	\$0	\$0	\$0	\$0	\$0	\$1,000,000

<p>C.EN.101508 - 11TH AV VENT SHAFT AUTOMATIC TRANSFER SW</p> <p>Upgrade to the automatic transfer switch in the 11th Ave., vent shafts supporting the North River Tunnel. The project is to address life safety and SOGR needs with the existing tunnel venting system.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - SOGR - Resilience
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Location: Line code - AZ, milepost 1.68. North River Tunnel. PRIIA segment 12.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101508 Total
\$1,300,000	\$0	\$0	\$0	\$0	\$0	\$1,300,000

<p>C.EN.100670 - NY015.73 PELHAM BAY-BRDG REPLACEMENT DSN</p> <p>Replacement Design for the Pelham Bay Bridge. This project would replace the century-old movable Pelham Bay Bridge, which crosses the Hutchinson River in the Bronx, NY, with either a new high-level fixed bridge or a mid-level movable bridge with clearance for marine traffic.</p> <p>Justification: The Pelham Bay Bridge was built in 1907. The movable span consists of a two-track 82-foot long through truss. This bridge creates a bottleneck by constricting traffic down to speeds of 45 mph. The aging bridge still opens frequently for marine traffic and occasionally fails to properly close, creating delays for Amtrak service between Boston and New York as well as delays in freight and commuter service, which use the line. This asset will not provide the reliability needed for future expansion of train operations until the movable span is upgraded.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Major Backlog - Strategic Initiatives that improve operational performance, lower cost or improve efficiency <p>Also Supports:</p> <ul style="list-style-type: none"> - Backlog Capital Replacement 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - Journey Time Capability - SOGR - Resilience
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Location: Linecode - AG, milepost 15.73. Pelham Bay Bridge. PRIIA segment 8.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100670 Total
\$1,000,000	\$5,000,000	\$5,000,000	\$1,000,000	\$5,500,000	\$5,500,000	\$23,000,000

Bridges and Buildings Capital Program – NEC Branch Line

<p>C.EN.100709 - NJ008.50 BRG CONTROL UPGRS</p> <p>Upgrades for Dock moveable bridge in Newark NJ. MP 8.50 to include control line , direct drive emergency internal combustion engine, and removal and reinstallation of the auxiliary direct drive on span C track 1.</p> <p>Location: Linecode - AE, milepost 8.5. Dock Bridge. PRIIA segment 12.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - SOGR - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100709 Total
\$250,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$2,750,000

<p>C.EN.101307 - EMPIRE CORRIDOR UNDERGRADE BRG UPGRADES</p> <p>Program of work to address undergrade bridges currently not in a SOGR. Program includes conversion of open deck under-grade bridges to ballast deck for improved train performance. Some of the under-grade bridges can be brought to a SOGR through selective component replacement and others will require complete replacement.</p>	<p>FAST Act Category: - Improvements</p> <p>Also Supports: - Backlog Capital Replacement</p>	<p>Construction Program Priority: N/A</p> <p>Project Benefits: - SOGR - Safety - Resilience</p>
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Location:Line code - AR, milepost TBD. No PRIIA Segment.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101307 Total
\$1,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$4,000,000	\$21,000,000

<p>C.EN.101528 - NY010.25 SPUYTEN DUYVIL-SANDY MECH-ELECT</p> <p>Rehabilitation of the mechanical and electrical machinery of the movable portion of the Harlem River bridge, Spuyten Duyvil. The project is to address SOGR backlog resulting from damage to the bridge during Superstorm Sandy. The work will improve the operational reliability and resilience of the bridge and progress it towards SOGR.</p>	<p>FAST Act Category: - Improvements</p>	<p>Construction Program Priority: N/A</p> <p>Project Benefits: - SOGR - Resilience</p>
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Location: Linecode - AE, milepost 10.25. PRIIA segment 27.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101528 Total
\$700,000	\$0	\$0	\$0	\$0	\$0	\$700,000

<p>C.EN.101625 - EMPIRE TUNNEL - TUNNEL IMPROVEMENTS</p> <p>Improvements to the Empire Tunnel to address SOGR needs and backlog repair. Project includes component replacement and rehabilitation to maintain safe operation and to maintain reliability.</p> <p>Location: Line Code - AE, milepost 0.82. North Access Tunnel. PRIIA segment 27.</p>	<p>FAST Act Category: - Normalized Replacement</p>	<p>Construction Program Priority: 13</p> <p>Project Benefits: - Safety - SOGR - Resilience</p>
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101625 Total
\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$6,000,000

<p>C.EN.101256 - NED SPRINGFIELD LINE-BRIDGE TIMB REPLACE</p> <p>Replacement of bridge timbers along the Springfield Line, North East Division. Replacement of aging and deteriorated timbers will address SOGR needs, improve safety, efficiency and operational reliability.</p> <p>Location: Linecode - AS, milepost TBD. PRIIA segment 25.</p>	<p>FAST Act Category: - Improvements</p>	<p>Construction Program Priority: N/A</p> <p>Project Benefits: - SOGR - Safety - Resilience</p>
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101256 Total
\$500,000	\$3,000,000	\$0	\$0	\$0	\$0	\$3,500,000

<p>C.EN.101295 - EMPIRE CORRIDOR BRG TIMBER REPLACEMENT</p> <p>Replacement of bridge timbers along the Empire Corridor. Replacement of aging and deteriorated timbers will address SOGR needs, improve safety, efficiency and operational reliability.</p> <p>Location: Line code - AR, milepost TBD. No PRIIA Segment.</p>	<p>FAST Act Category: - Improvements</p>	<p>Construction Program Priority: 9</p> <p>Project Benefits: - SOGR - Safety - Resilience</p>
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101295 Total
\$750,000	\$750,000	\$750,000	\$750,000	\$750,000	\$750,000	\$4,500,000

<p>C.EN.101791 - NY010.25 SPUYTEN DUYVIL-FENDER SYS UPGRD</p> <p>The east side fender system of BGMS 10.20 Spuyten Duyvil Bridge is in the need of replacement. The west fender was replaced around 2008-09. Design for the fender is completed, and project needs to move into the "Construction Phase" and managed by the "Project Delivery" Group.</p> <p>Location: Linecode - AE, milepost 10.25. PRIIA segment 27.</p>	<p>FAST Act Category: - Improvements</p>	<p>Construction Program Priority: N/A</p> <p>Project Benefits: - Safety - SOGR - Resilience</p>
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101791 Total
\$5,000,000	\$5,000,000	\$0	\$0	\$0	\$0	\$10,000,000

C.EN.100185 - CULV ALBANY LINE - CULVERTS UPGRADES
Improvement to culverts on the Albany Line to address SOGR and backlog repair. Projects includes rehabilitation through to complete replacement. The program will progress assets to SOGR and improve network resilience.

Location: Linecode - AR, milepost TBD. PRIIA segment - Not in PRIIA (Poughkeepsie - Hoffmans, Empire Corridor W)

FAST Act Category:
- Improvements

Construction Program
Priority:
N/A

Project Benefits:
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100185 Total
\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$1,500,000

Bridges and Buildings Capital Program – National Network

C.EN.101678 - AMTRAK NATIONAL UNDERGRADE BRIDGE UPGRS

Program to bring Amtrak's national under-grade bridges to a SOGR. Some of the bridges will be brought to a SOGR through selective component replacement while others require complete replacement of movable structure, mechanical and electrical systems.

Location: National Network wide.

FAST Act Category:
- Improvements

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101678 Total
\$1,000,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$13,500,000

C.EN.101708 - AMTRAK NATIONAL MOVABLE BRIDGE UPGRADES

Program to bring Amtrak's movable bridges to a SOGR. Some of the bridges will be brought to a SOGR through selective component replacement while others require complete replacement of movable structure, mechanical and electrical systems.

Location: National Network wide.

FAST Act Category:
- Normalized Replacement

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101708 Total
\$1,250,000	\$1,000,000	\$1,500,000	\$1,000,000	\$1,000,000	\$1,000,000	\$6,750,000

C.EN.101712 - AMTRAK NATIONAL SIGNAL BRIDGE UPGRADES
 Redecking of signal bridges and installation of fall protection equipment, including tie offs and safety lines. Projects will improve safety, and operational efficiency.

Location: National Network wide.

FAST Act Category:
 - Normalized Replacement
 - Statutory, regulatory, or other legal mandates
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
 N/A

Project Benefits:
 - Safety

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101712 Total
\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$3,000,000

C.EN.101709 - AMTRAK NATIONAL RETAINING WALL UPGRADES
 Rehabilitation or replacement of retaining walls to address SOGR needs and backlog repair. Projects will improve safety and reliability.

Location: National Network wide.

FAST Act Category:
 - Normalized Replacement
FAST Act Categories:
 -Normalized Cap. Replacement
 -Backlog Cap. Replacement
 -Improvements to Support Service Enhancements or growth
 -Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
 N/A

Project Benefits:
 - Safety
 - Journey Time Capability
 - SOGR
 - Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101709 Total
\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$3,000,000

C.EN.101679 - AMTRAK NATIONAL CULVERT UPGRADES
 Improvement to culverts on the National Network to address SOGR and backlog repair. Projects includes rehabilitation through to complete replacement. The program will progress assets to SOGR and improve network resilience.

Location: National Network wide.

FAST Act Category:
 - Normalized Replacement

Construction Program
Priority:
 N/A

Project Benefits:
 - Safety
 - SOGR
 - Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101679 Total
\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$1,800,000

C.EN.101741 - WHIRLPOOL BRIDGE REPLACE BRIDGE TIMBER Replacement of aging and deteriorated timbers on the Whirlpool Bridge, to address SOGR needs, improve safety, efficiency and operational reliability. Location: National Network - Whirlpool Rapids Bridge, Niagara Falls, NY.	FAST Act Category: - Improvements	Construction Program Priority: N/A Project Benefits: - Safety - SOGR - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101741 Total
\$6,000,000	\$0	\$0	\$0	\$0	\$0	\$6,000,000

Bridges and Buildings Capital Program – New York State

C.EN.100732 - EMPIRE LINE OVERBUILD LIGHTING Install new electrical service, piping and ninety new lighting fixtures at the overbuild between 38th and 41st Street, in New York (Empire Line). Location: Linecode - AR, milepost TBD. PRIIA segment - Not in PRIIA (Poughkeepsie - Hoffmans, Empire Corridor W)	FAST Act Category: - Safety & Mandates -	Construction Program Priority: N/A Project Benefits: - Safety - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100732 Total
\$4,000,000	\$4,000,000	\$250,000	\$250,000	\$250,000	\$250,000	\$9,000,000

C.EN.100957 - BGMS NY143.02 LAB - BRIDGE MECHANICAL AN Rehabilitation of the mechanical and electrical turning machinery and end machinery of the movable portion of Livingston Avenue (LAB) Bridge in Albany, NY. The movable portion of this bridge is a rim-bearing swing bridge operated by electric motors and mechanical linkages. Location: Linecode - AR, milepost 143.02. LAB Bridge. PRIIA segment - Not in PRIIA (Poughkeepsie - Hoffmans, Empire Corridor W)	FAST Act Category: - Improvements	Construction Program Priority: N/A Project Benefits: - Safety - SOGR - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100957 Total
\$1,000,000	\$0	\$0	\$0	\$0	\$0	\$1,000,000

Bridges and Buildings Capital Program – Michigan

None.

Bridges and Buildings Capital Program – Other Department

C.EV.100633 - WILMINGTON MOFE FACILITY-PCB/O
PCB Remediation at the Wilmington MofE Facility -
removal of contaminated soil, gravel and concrete.

Location: NEC MofE Facility

FAST Act Category:

- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction
Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100633 Total
\$2,250,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$27,250,000

C.EV.100003 - TRENTON NJ - COMMUTER YARD
REMEDIATION
Environmental Remediation of the Wilmington MofE
Facility

Location: NEC MofE Facility

FAST Act Category:

- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction
Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100003 Total
\$150,000	\$4,000,000	\$5,000,000	\$5,000,000	\$100,000	\$100,000	\$14,350,000

C.EV.100023 - NEWARK PENN STATION PCB
REMEDIATION
PCB Remediation at Newark Penn Station - removal of
contaminated soil, gravel and concrete.

Location: Linecode - AN, milepost 9. PRIIA segment 12.

FAST Act Category:

- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction
Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100023 Total
\$400,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$5,400,000

C.EV.100036 - LA WASTEWATER/STORMWATER UPGR
Environmental Remediation works.

Location: National Network

FAST Act Category:
- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100036 Total
\$100,000	\$1,000,000	\$400,000	\$200,000	\$1,500,000	\$1,500,000	\$4,700,000

C.EV.100374 - CEDAR HILL REMEDATION
Environmental Remediation works.

Location: National Network

FAST Act Category:
- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100374 Total
\$5,000,000	\$500,000	\$1,000,000	\$1,000,000	\$250,000	\$300,000	\$8,050,000

C.EV.100021 - 30TH ST STA PLTF AREA PCB REMEDIATION
PCB Remediation at 30th Street Station - removal of contaminated soil, gravel and concrete.

Location: NEC Wide

FAST Act Category:
- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100021 Total
\$1,000,000	\$1,500,000	\$500,000	\$250,000	\$250,000	\$300,000	\$3,800,000

C.EV.100031 - "Asbestos, Lead Paint and Mold" Removal of lead paint and mold				FAST Act Category: - Environmental Remediation - Statutory, regulatory, or other legal mandates - Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: N/A Project Benefits: - Safety - SOGR
Location: National Network						
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100031 Total
\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$3,000,000
C.EV.100033 - SUNNYSIDE YARD OIL/PCB REMED PCB Remediation at Sunnyside Yard - removal of contaminated soil, gravel and concrete.				FAST Act Category: - Environmental Remediation - Statutory, regulatory, or other legal mandates - Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: N/A Project Benefits: - Safety - SOGR
Location: NEC Wide						
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100033 Total
\$700,000	\$700,000	\$500,000	\$500,000	\$100,000	\$100,000	\$2,600,000
C.EV.201240 - Wilmington West Yard Environmental Remediation works.				FAST Act Category: - Environmental Remediation - Statutory, regulatory, or other legal mandates - Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: N/A Project Benefits: - Safety - SOGR
Location: NEC Wide						
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.201240 Total
\$150,000	\$300,000	\$700,000	\$200,000	\$200,000	\$200,000	\$1,750,000

C.EV.100019 - IVY CITY SEWER SYSTEM UPGRADE
Environmental Remediation works.

Location: National Network

FAST Act Category:

- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:

- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100019 Total
\$500,000	\$350,000	\$300,000	\$250,000	\$100,000	\$100,000	\$1,600,000

C.EV.100016 - CHI YDS ENGINE-PUMP HOUSE IMPROV
FLOOR
Environmental Remediation works.

Location: National Network

FAST Act Category:

- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:

- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100016 Total
\$400,000	\$500,000	\$100,000	\$100,000	\$100,000	\$100,000	\$1,300,000

C.EV.100029 - LAN C&S SHOP H2O
INVESTIGATE/REMEDIATION
Environmental Remediation - investigate water treatment system and reme3diate as required

Location: National Network

FAST Act Category:

- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:

- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100029 Total
\$100,000	\$250,000	\$250,000	\$100,000	\$100,000	\$100,000	\$900,000

C.EV.100026 - BEAR DE WASTEWATER SYSTEM UPGRADE
Environmental Remediation - Upgrade of stormwater treatment system

Location: National Network

FAST Act Category:
- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority: N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100026 Total
\$300,000	\$500,000	\$50,000	\$0	\$0	\$0	\$850,000

C.EV.100002 - NEW BRUNSWICK COMMUTER YARD REMEDIATION
Environmental Remediation works.

Location: NEC Wide

FAST Act Category:
- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority: N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100002 Total
\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$1,200,000

C.EV.100005 - SANFORD FL - STORM WATER SYSTEM UPGRADE
Environmental Remediation - Upgrade of stormwater treatment system

Location: National Network

FAST Act Category:
- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority: N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100005 Total
\$150,000	\$200,000	\$200,000	\$0	\$0	\$0	\$550,000

C.EV.201069 - Wilmington Maintenance Facility Stormwater Environmental Remediation - Upgrade of stormwater treatment system

Location: NEC Wide

FAST Act Category:
 - Environmental Remediation
 - Statutory, regulatory, or other legal mandates
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
 Priority:
 N/A

 Project Benefits:
 - Safety
 - SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.201069 Total
\$125,000	\$200,000	\$100,000	\$100,000	\$0	\$0	\$525,000

C.EV.100001 - SUNNYSIDE YARD ASBESTOS WRAP ABATEMENT
 Environmental Remediation - Asbestos treatment and abatement at the Sunnyside Yard

Location: NEC Wide

FAST Act Category:
 - Environmental Remediation
 - Statutory, regulatory, or other legal mandates
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
 Priority:
 N/A

 Project Benefits:
 - Safety
 - SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100001 Total
\$700,000	\$100,000	\$0	\$0	\$0	\$0	\$800,000

C.EV.100028 - LOS ANGELES OFFSITE GROUNDWATER ISSUES
 Environmental Remediation works.

Location: National Network

FAST Act Category:
 - Environmental Remediation
 - Statutory, regulatory, or other legal mandates
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
 Priority:
 N/A

 Project Benefits:
 - Safety
 - SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100028 Total
\$50,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$550,000

C.EV.100008 - HIALEAH FL PAHS REMEDIATION Environmental Remediation - PAH Remediation at Hialeah, Florida - removal of contaminated soil and gravel. Location: National Network				FAST Act Category: - Environmental Remediation - Statutory, regulatory, or other legal mandates - Strategic Initiatives that improve operational performance, lower cost or improve efficiency	Construction Program Priority: N/A Project Benefits: - Safety - SOGR
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100008 Total
\$75,000	\$50,000	\$50,000	\$0	\$0	\$0	\$175,000

C.EV.100004 - NEW ORLEANS FUELING FACILITY UPGRS Environmental Remediation - Upgrade to the New Orleans Fueling facility to improve prevent environmental incidents Location: National Network				FAST Act Category: - Environmental Remediation - Statutory, regulatory, or other legal mandates - Strategic Initiatives that improve operational performance, lower cost or improve efficiency	Construction Program Priority: N/A Project Benefits: - Safety - SOGR
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100004 Total
\$3,000,000	\$0	\$0	\$0	\$0	\$0	\$3,000,000

C.EV.100014 - PENN COACH YD FUELING SITE SPILL PREVENT Environmental Remediation - Construction of fueling spill prevention at Penn Coach Yard Location: NEC Wide				FAST Act Category: - Environmental Remediation - Statutory, regulatory, or other legal mandates - Strategic Initiatives that improve operational performance, lower cost or improve efficiency	Construction Program Priority: N/A Project Benefits: - Safety - SOGR
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100014 Total
\$3,000,000	\$0	\$0	\$0	\$0	\$0	\$3,000,000

C.EV.100022 - SOUTHAMPTON ST YD WASTEWATER PLANT UPGR
Environmental Remediation - Upgrade of the wastewater Plant at Southampton St Yards

Location: NEC Wide

FAST Act Category:
- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority: N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100022 Total
\$200,000	\$0	\$0	\$0	\$0	\$0	\$200,000

C.EV.100370 - ENV POLLUTION PREVEN PRJ DSGN
Environmental Remediation - Design support to prevent environmental pollution

Location: National Network

FAST Act Category:
- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority: N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100370 Total
\$300,000	\$0	\$0	\$0	\$0	\$0	\$300,000

C.EV.100635 - BEECH GROVE FACILITY - WASTEWA
Environmental Remediation - Upgrade of the wastewater Plant at Beech Grove Facility

Location: National Network

FAST Act Category:
- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority: N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100635 Total
\$800,000	\$0	\$0	\$0	\$0	\$0	\$800,000

C.EV.201070 - Oakland Stormwater Treatment System
Environmental Remediation - Construction of a stormwater treatment system in Oakland.

Location: National Network

FAST Act Category:
- Environmental Remediation

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.201070 Total
\$250,000	\$0	\$0	\$0	\$0	\$0	\$250,000

C.EV.100017 - SANFORD AUTO TRAIN FAC ENVIR
REMEDICATION
Environmental Remediation - Environmental remediation at the Sanford Auto Train Facility

Location: National Network

FAST Act Category:
- Environmental Remediation
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EV.100017 Total
\$50,000	\$0	\$0	\$0	\$0	\$0	\$50,000

Bridges and Buildings Capital Program – Significant Projects

C.EN.100498 - CHI 14TH ST YD RETAINING WALL
Completely reconstruct approximately 300-Feet of retaining wall along the river at 15th St. in Chicago 14th Street Yard. Work to include design, demolition of existing structure, installation of temporary sheet piling, excavation, installation of tie backs, concrete work, and reconstruction of roadway surface.

Location: Linecode - IC. Chicago 14th St. Yard.

FAST Act Category:
- Improvements

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100498 Total
\$8,000,000	\$12,000,000	\$-	\$-	\$-	\$-	\$20,000,000

C.EN.201278 - B&P TUNNEL REPLACEMENT DSN
Preliminary Design of the replacement of the John St., Wilson St., and Gilmore St. Tunnels - more commonly referred to as the Baltimore and Potomac Tunnel. This project would replace the aging B&P Tunnel, a key chokepoint where the right-of- way is reduced from four to two tracks and the tunnel's tight curvature require trains to reduce speeds to 30 mph. The existing tunnel is in need of constant monitoring and maintenance at high cost. This project would replace the existing two-track tunnel with a new four-track tunnel (as four single track bores) on an improved alignment.
Justification: Built in 1873, the existing two-track tunnel is nearing the end of its useful life. Improvements are required in order to maintain operations through this section of Baltimore and additional tracks are needed to meet future demand.

FAST Act Category:
- Improvements

Also Supports:
- Normalized Capital Replacement
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program Priority:
N/A

Project Benefits:
- Safety
- SOGR
- Resilience

Location: Linecode - AP, milepost 96.11. John St Tunnel. PRIIA segment 22.
AND
Linecode - AP, milepost 96.60. Wilson St Tunnel. PRIIA segment 22.
AND
Linecode - AP, milepost 97.22. Gilmore St Tunnel. PRIIA segment 22.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.201278 Total
\$10,000,000	\$30,000,000	\$60,000,000	\$100,000,000	\$100,000,000	\$200,000,000	\$500,000,000

C.EN.101457 - NEW YORK TUNNELS REHABILITATION DESIGN

Following Superstorm Sandy (Sandy) two of Amtrak's New York City tunnels were inundated with sea water. The inundated tunnels were Amtrak's North (Hudson) River Tunnel and East River Tunnel. Sea water entered into ventilation shafts at First and Eleventh Avenues in Manhattan, at the portal from Lines 1 and 2 in Long Island City, Queens, and at the portal for the North River tubes in Manhattan. After the tunnels were dewatered, chlorides and sulfates began to damage and are continuing to damage Amtrak's tunnels. Amtrak retained an outside consultant to evaluate the tunnels, and the consultant issued a report that contains various recommendations. This project will initiate design of benchwall replacement and direct fixation rail systems as recommended in that report. The intent of the project is: 1) to investigate the feasibility of using ballasted-less track to replace the existing ballasted track system, and provide conceptual and preliminary design required for the track and associated roadbed, 2) to investigate reconstruction of duct banks within the interior structural envelope of the tunnels and to provide conceptual and preliminary design, and 3) to provide preliminary design for "immediate" cleaning and repair activities.

Location: Line code - AT, milepost 1.44. East River Tunnel. PRIIA segment 10.

AND

Line code - AE, milepost 0.56. North Access Tunnel. PRIIA segment 11.

AND

Line code - AZ, milepost 1.68. North River Tunnel. PRIIA segment 12.

FAST Act Category:

- Major Backlog

Also Supports:

-Improvements to Support Service Enhancements or growth

-Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction

Program

Priority:

N/A

Project Benefits:

- Safety

- SOGR

- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101457 Total
\$12,300,000	\$6,000,000	\$3,000,000	\$-	\$-	\$150,000,000	\$171,300,000

C.EN.101004 - MD060.07 SUSQUEHANNA BRIDGE REPLACEMENT

Replacement of the Susquehanna River bridge to address SOGR and to increase capacity necessary for HSR services between Philadelphia and Washington, DC. This project would replace the existing two-track movable Susquehanna River Bridge with two modern highlevel, fixed structures, each with two tracks. The project would benefit commuter and intercity rail as well as Norfolk Southern, which uses the segment to access the Port of Baltimore.

Justification: Built in 1906, the existing two-track bridge is nearing the end of its useful life. The current bridge requires trains to reduce speeds for almost a mile due to its condition. A new asset is required in order to maintain operations through this section of Maryland and additional tracks are needed to meet future demand.

FAST Act Category:
- Major Backlog

Construction Program Priority:
N/A

Project Benefits:
- Safety
- Journey Time Capability
- SOGR
- Resilience

Location: Linecode - AP, milepost - 60.07. Susquehanna River Bridge. PRIIA segment 22.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101004 Total
\$4,000,000	\$-	\$10,000,000	\$20,000,000	\$10,000,000	\$200,000,000	\$244,000,000

C.EN.100190 - CT106.89 CONN RV REPL DESIGN

Design of the replacement or rehabilitation of bridge number 106.89 Connecticut River on the Shore Line, New England Division. This project would replace the Connecticut River Bridge between Old Saybrook and Old Lyme, CT that carries Amtrak and Shore Line East trains. Completed in 1907, it is the oldest movable bridge between New Haven, CT and Boston, MA. The bridge has a movable span that is raised up to allow boats to pass. By law, the bridge must remain open from May through September for recreational boats to pass and closes only when trains approach. Plans would replace the Connecticut River Bridge with a new design that improves reliability and offers higher speeds for Amtrak and Shore Line East trains. FRA completed NEPA and issued a Finding of No Significant Impact (FONSI) for this project in January 2017. Preliminary design is underway, but no funding is available for final design or construction.

Justification: A century of operation in a marine environment, coupled with the age of the structure, has taken its toll and speeds are restricted to 45 mph. Many key elements of the bridge have reached the end of their design life and require extensive maintenance to remain in operable condition. The frequent opening and closing of the bridge – over 3,000 times per year – puts high demands on its aging components, increasing maintenance costs for Amtrak and reducing reliability for both railway and marine traffic.

FAST Act Category:
- Major Backlog

Construction
Program
Priority:
N/A

Project Benefits:
- Safety
- Journey Time
Capability
- SOGR
- Resilience

Location: Linecode - AB, milepost 106.89. Connecticut River Bridge. PRIIA segment 5.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100190 Total
\$2,000,000	\$-	\$2,000,000	\$5,000,000	\$11,000,000	\$5,000,000	\$25,000,000

C.EN.101192 - BGMS MD072.14 BUSH RIVER BRIDGE - REPLACEMENT BRIDGE DESIGN
 Replace the half-mile long Bush River Bridge connecting Edgewood and Perryman, Maryland that was completed in 1913 and currently carries Amtrak, MARC commuter, and Norfolk Southern freight trains. Planning and design for a replacement bridge would explore constructing a new fixed bridge with enough clearance to allow boats to pass below, significantly improving mobility for both maritime and rail traffic. Planning would also consider options for providing additional capacity for intercity, commuter, and freight railroad operations. Service reliability is under threat due to aging bridge components, which require continued maintenance.

FAST Act Category:
 - Major Backlog
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Also Supports:
 - Backlog Capital Replacement

Construction Program Priority:
 N/A

Project Benefits:
 - Safety
 - Journey Time Capability
 - SOGR
 - Resilience

Location: Linecode - AP, milepost - 71.87. Bush River Bridge. PRIIA segment 22.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101192 Total
\$-	\$-	\$-	\$5,000,000	\$25,000,000	\$100,000,000	\$130,000,000

C.EN.101193 - BGUG MD078.86 GUNPOWDER RIVER - REPLACEMENT BRIDGE DESIGN
 Replace the Gunpowder River Bridge, an approximately one-mile long crossing between Chase and Joppa, MD. It carries Amtrak, MARC commuter, and Norfolk Southern freight trains. Design options for consideration include a higher-capacity four-track bridge that would increase service potential and reliability for Amtrak, MARC, and freight service. Potential for a separate freight track would also be examined as part of the plan, which would facilitate freight service at all times of day. The existing Gunpowder River Bridge was completed in 1913. Worsening infrastructure conditions have led to more intensive maintenance and costs. Freight trains are restricted to nighttime operations over the bridge, as the two tracks are at capacity during normal passenger rail operating hours.

FAST Act Category:- Major Backlog- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
Also Supports:- Backlog Capital Replacement

Construction Program Priority:
 N/A
Project Benefits: - Safety- Journey Time Capability- SOGR- Resilience

Location: Linecode - AP, milepost - 78.38. Gunpowder River Bridge. PRIIA segment 22.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101193 Total
\$-	\$-	\$-	\$-	\$5,000,000	\$25,000,000	\$30,000,000

GATEWAY PROGRAM

(NOT INCLUDED IN THE SUMMARIZED PROJECT COSTS FOR BRIDGES AND BUILDINGS IN TABLE 9 AND TABLE 78).

<p>C.EN.101616 - NEW HUDSON RIVER TUNNEL CONSTRUCTION</p> <p>The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.</p> <p>Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.</p>	<p><u>FAST Act Category:</u> Non Re-occurring Project</p> <ul style="list-style-type: none"> - Strategic Initiatives that improve operational performance, lower cost or improve efficiency - Improvements to Support Service Enhancements or growth <p>Also Supports:</p> <ul style="list-style-type: none"> - Backlog Capital Replacement (of the existing North River Tunnel) 	<p><u>Construction Program</u> <u>Priority:</u> N/A</p> <p><u>Project Benefits:</u></p> <ul style="list-style-type: none"> - SOGR - Resilience - Journey Time Capability
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101616 Total
\$12,500,000	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

<p>C.EN.100507 - NJ007.80&NJ007.96-BRDG CAPACITY UPGR DESIGN</p> <p>Bridge capacity upgrade design for Bridge NJ007.80 (crossing NJ Transit lines) and NJ007.96 (crossing PATH and Conrail). Both are I-Beam with concrete slab bridges - constructed in 1910 and are reaching the end of their useful lives.</p> <p>Location: Line code - AZ, milepost 7.75 and 7.93. PRIIA segment 12.</p>	<p><u>FAST Act Category:</u> Non Re-occurring Project</p> <ul style="list-style-type: none"> - Strategic Initiatives that improve operational performance, lower cost or improve efficiency - Improvements to Support Service Enhancements or growth <p>Also Supports:</p> <ul style="list-style-type: none"> - Backlog Capital Replacement 	<p><u>Construction Program</u> <u>Priority:</u> N/A</p> <p><u>Project Benefits:</u></p> <ul style="list-style-type: none"> - SOGR - Resilience - Journey Time Capability
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100507 Total
\$8,245,000	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

C.EN.101458 - GATEWAY PROGRAM MANAGEMENT
 Gateway is a comprehensive program of strategic rail infrastructure improvements designed to improve current services and create new capacity that will allow the doubling of passenger trains running under the Hudson River. The program will increase track, tunnel, bridge, and station capacity, eventually creating four mainline tracks between Newark, NJ, and Penn Station, New York, including a new, two-track Hudson River tunnel.

Location: Line Code - AZ (Gateway). PRIIA segment 12.

FAST Act Category:
 Non Re-occurring Project
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency
 - Improvements to Support Service Enhancements or growth

Also Supports:
 - Backlog Capital Replacement (of existing assets)

Construction Program Priority:
 N/A
Project Benefits:
 - SOGR
 - Resilience
 - Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101458 Total
\$9,562,783	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

C.EN.101195 - NJ006.10 NEW PORTAL NORTH BR CONSTR
 Design and construction of the two-track replacement bridge. Portal North Bridge will be designed as a high-level, fixed-span bridge, eliminating the movable components and risk of malfunction.

Location: Line code - AZ, milepost 6. PRIIA segment 12.

FAST Act Category:
 Non Re-occurring Project
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency
 - Improvements to Support Service Enhancements or growth

Also Supports:
 - Backlog Capital Replacement (of existing assets)

Construction Program Priority:
 N/A
Project Benefits:
 - SOGR
 - Resilience
 - Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101195 Total
\$2,285,638	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

<p>C.EN.100876 - HARRISON NY 4TH TK DESIGN AND INITIATION</p> <p>Design and initiation of capacity improvements in Harrison</p> <p>Location: Line code - AZ, milepost 7 (estimated). PRIIA segment 12.</p>	<p><u>FAST Act Category:</u></p> <p>Non Re-occurring Project</p> <ul style="list-style-type: none"> - Strategic Initiatives that improve operational performance, lower cost or improve efficiency - Improvements to Support Service Enhancements or growth 	<p><u>Construction Program Priority:</u></p> <p>N/A</p> <p><u>Project Benefits:</u></p> <ul style="list-style-type: none"> - SOGR - Resilience - Journey Time Capability
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100876 Total
\$1,000,000	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

<p>C.EN.101459 - HUDSON RIVER-CONSTRUCT NEW TUNNELS DESIGN</p> <p>The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.</p> <p>Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.</p>	<p><u>FAST Act Category:</u></p> <p>Non Re-occurring Project</p> <ul style="list-style-type: none"> - Strategic Initiatives that improve operational performance, lower cost or improve efficiency - Improvements to Support Service Enhancements or growth <p>Also Supports:</p> <ul style="list-style-type: none"> - Backlog Capital Replacement (of existing assets) 	<p><u>Construction Program Priority:</u></p> <p>N/A</p> <p><u>Project Benefits:</u></p> <ul style="list-style-type: none"> - SOGR - Resilience - Journey Time Capability
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101459 Total
\$25,000,000	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

C.EN.100879 - GATEWAY PRELIMINARY DESIGN AND PLANNING

Gateway is a comprehensive program of strategic rail infrastructure improvements designed to improve current services and create new capacity that will allow the doubling of passenger trains running under the Hudson River. The program will increase track, tunnel, bridge, and station capacity, eventually creating four mainline tracks between Newark, NJ, and Penn Station, New York, including a new, two-track Hudson River tunnel.

Location: Line Code - AZ (Gateway). PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of existing assets)

Construction

Program

Priority:

N/A

Project Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100879 Total
\$4,000,000	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

C.EN.101613 - NEW HUDSON RIV TUN PROPERTY ACQUISITION

The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of existing assets)

Construction

Program

Priority:

N/A

Project Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101613 Total
\$5,000	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

C.EN.100878 - CONSTRUCT NEW FIXED PORTAL NORTH BRIDGE
Design and construction of the two-track replacement bridge. Portal North Bridge will be designed as a high-level, fixed-span bridge, eliminating the movable components and risk of malfunction.

Location: Line code - AZ, milepost 6. PRIIA segment 12.

FAST Act Category:
Non Re-occurring Project
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:
- Backlog Capital Replacement (of existing assets)

Construction Program Priority:
N/A

Project Benefits:
- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100878 Total
\$405,000	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

C.EN.100875 - TUN NY GATEWAY CONCRETE CASING & RIGHT of WAY PRESERVATION-HUDSON YARDS D
The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:
Non Re-occurring Project
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:
- Backlog Capital Replacement (of existing assets)

Construction Program Priority:
N/A

Project Benefits:
- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100875 Total
\$1,316,909	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

C.EN.101164 - HUDSON YD CONSTRUCT CONCRETE CASING & RIGHT of WAY PRESERVATION SEGMENT 1
The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:
Non Re-occurring Project
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:
- Backlog Capital Replacement (of existing assets)

Construction Program Priority:
N/A
Project Benefits:
- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101164 Total
\$5,000,000	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

C.SP.100038 - HUDSON RIVER CONSTRUCT NEW TUNNELS NEPA
The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:
Non Re-occurring Project
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:
- Backlog Capital Replacement (of existing assets)

Construction Program Priority:
N/A
Project Benefits:
- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.SP.100038 Total
\$2,316,306	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

C.SP.10003X - HUDSON PROPERTY ACQUISITION RESERVE

The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of existing assets)

Construction

Program

Priority:

N/A

Project Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.SP.10003X Total
\$0	Note: Gateway Program projects are constrained at FY2019 levels – as per 24320(a)(2). Additional proposed investments in the Gateway Program in FY2020 to FY2024 are provided in Appendix I.					

Electric Traction – FY19 to FY24 Constrained Capital Program

Electric Traction Capital Program – NEC Main Line

C.EN.101239 - SUNNYSIDE YARD CONVERTER REPLACEMENT

Preliminary engineering design (30% design), and delivery of a detailed bid package for the design/construction/commissioning of replacement equipment at the Sunnyside Yard Static Frequency Converter (SSYD SFC). SSYD SFC was commissioned in 1998 and is one of the six frequency converter stations that provide power to Amtrak's 25Hz traction power network on the South End (Washington D.C. to New York and Philadelphia to Harrisburg). The converters are approaching 20 years of service and consequently the end of their expected service life. SSYD SFC currently consists of four (4) 9.375MVA (7.5MW) static frequency converters and is rated to provide 37.5MVA (30MW) of power continuously. SSYD SFC provides power primarily to Amtrak and New Jersey Transit train operations in New York, from North Bergen, NJ to Sunnyside Yard, Queens, NY. This includes all operation within Penn Station and the North/ East river tunnels.

FAST Act Category:
- Normalized Replacement

Also Supports:
- Backlog Capital Replacement
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
-Safety
-Journey Time
Capability
-SOGR
-Resilience

Location: Sunnyside Yard frequency converter. PRIIA segment 12.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101239 Total
\$1,000,000	\$12,156,089	\$17,767,494	\$18,042,848	\$12,991,506	\$1,000,000	\$62,957,937

C.EN.101688 - AMTRAK NEC SUBSTATION UPGRADES
Improvements to electric traction substation components to include air brakes, breakers, remote terminal units, control house renovations, substation lighting, fencing, etc. as needed based on inspection and testing of the various components.

Location: Linecode - AP, milepost 51.3. PRIIA segment 21.

FAST Act Category:
- Normalized Replacement

Also Supports:
- Backlog Capital Replacement
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
11

Project Benefits:
-Safety
-Journey Time
Capability
-SOGR
-Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101688 Total
\$4,500,000	\$15,925,000	\$15,450,000	\$7,000,000	\$6,850,000	\$6,850,000	\$56,575,000

C.EN.101784 - WAS-PHI TOTAL CATENARY RENEWAL Design and construction of the total catenary system (poles, wire, insulators, etc) along the Northeast Corridor from Washington, DC to New York. Location: Linecode - AP, milepost 0 to 137.1. PRIIA segments 17,18,19,20,21,22,23 and 24.				FAST Act Category: - Normalized Replacement Also Supports: - Backlog Capital Replacement - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: N/A Project Benefits: -Safety -Journey Time Capability -SOGR -Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101784 Total
\$100,000	\$0	\$0	\$0	\$0	\$0	\$100,000

C.EN.101783 - PSNY ET SECTIONALIZING SW/CABLE/RTU UPGR Upgrade of 78 obsolete sectionalizing switches, RTU's motors and cables, mostly within Penn Station, New York. Location: Linecode - AT, milepost 0. Penn Station. PRIIA segment 10.				FAST Act Category: - Improvements Also Supports: -Improvements to Support Service Enhancements or growth -Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: N/A Project Benefits: -Safety -Journey Time Capability -SOGR -Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101783 Total
\$500,000	\$3,500,000	\$12,000,000	\$12,000,000	\$10,000,000	\$0	\$38,000,000

C.EN.101689 - CAT AMTRAK NEC - CATENARY UPGRADES Replacement of the overhead catenary and hardware such as but not limited to wire, insulators, rods, and clips. Location: Linecode - AP, milepost 29.6. PRIIA segment 20.				FAST Act Category: - Normalized Replacement Also Supports: - Backlog Capital Replacement - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: 13 Project Benefits: -Safety -Journey Time Capability -SOGR -Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101689 Total
\$2,500,000	\$9,625,000	\$8,534,447	\$6,150,000	\$5,300,000	\$5,300,000	\$37,409,447

C.EN.101745 - HELLGATE LN SUB 45-47 REPLACE DSN/CONST Design/construction for a new substation on the Hellgate Line (between subs #45 and #47), including associated components. Location: Linecode AG. PRIIA segment 8.				FAST Act Category: - Improvements Also Supports: - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: N/A Project Benefits: -Safety -Journey Time Capability -SOG -Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101745 Total
\$50,000	\$250,000	\$500,000	\$10,000,000	\$10,000,000	\$0	\$20,800,000
C.EN.101739 - PENN STA NY WALKOVER 18 CONDUIT/CABLE Upgrade of Amtrak owned cable and conduit to support structure relocation of WPS 18 and modification associated to substation 43 at Penn Station New York, New York. Location: Linecode AT, milepost 0. PRIIA segment 10.				FAST Act Category: - Improvements Also Supports: - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: N/A Project Benefits: -Journey Time Capability -SOG -Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101739 Total
\$50,000	\$0	\$0	\$0	\$0	\$0	\$50,000
C.EN.101691 - AMTRAK NEC FREQUENCY CONVERTER UPGRADES Renewal and/or replacement of frequency converters that have exceeded their useful life and are currently not in a state of good repair. An example of work performed under this program is the replacement of rotary traction power frequency converters. Location: Linecode - AP, milepost 14.4. PRIIA segment 19.				FAST Act Category: - Normalized Replacement Also Supports: - Improvements to Support Service Enhancements or growth		Construction Program Priority: 12 Project Benefits: -Safety -Journey Time Capability -SOG -Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101691 Total
\$3,805,000	\$4,300,000	\$4,300,000	\$4,500,000	\$4,800,000	\$4,000,000	\$25,705,000

<p>C.EN.101750 - JERICO PARK FREQ REPLACE DSN/CONSTRUCT Design/construction for a new frequency converter station at Jericho Park, including associated components at the upgraded frequency converter station located near Bowie, Maryland.</p> <p>Location: Linecode - AP.</p>						
			<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 			<p>Construction Program Priority: N/A</p> <p>Project Benefits: -Safety -Journey Time Capability -SOGR -Resilience</p>
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101750 Total
\$10,000	\$300,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$20,310,000
<p>C.EN.101692 - AMTRAK NEC ET SWITCH HEATER UPGRS Upgrade of the switch heater stations to improve the reliability and serviceability of the equipment and provide reliable winter-time operation to reduce service delays.</p> <p>Location: Linecode - AP, milepost 59.5. PRIIA segment 22.</p>						
			<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement <p>Also Supports:</p> <ul style="list-style-type: none"> - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 			<p>Construction Program Priority: 11</p> <p>Project Benefits: -Safety -Journey Time Capability -SOGR -Resilience</p>
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101692 Total
\$1,950,000	\$3,200,000	\$3,600,000	\$4,200,000	\$3,100,000	\$600,000	\$16,650,000
<p>C.EN.101694 - AMTRAK NEC SIGNAL POWER UPGRADES Replacement and renewal of the existing rotary signal power machines that generate the 6,900 volts for the signal transmission lines. This equipment runs 24 hours a day, seven days a week, has many rotating parts and requires extensive maintenance. Another example of work provided under this program includes the upgrade of the open signal power wire to insulated cable at key locations.</p> <p>Location: Linecode - AP, milepost 95.8. PRIIA segment 22.</p>						
			<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement <p>Also Supports:</p> <ul style="list-style-type: none"> - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 			<p>Construction Program Priority: 13</p> <p>Project Benefits: -Safety -Journey Time Capability -SOGR -Resilience</p>
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101694 Total
\$1,500,000	\$3,000,000	\$2,425,000	\$3,635,000	\$3,635,000	\$1,375,000	\$15,570,000

C.EN.101690 - AMTRAK NEC CATENARY POLE UPGRADES
Renewal and replacement of existing catenary poles, associated hardware, foundations, and guy wire supports that are not currently in a state of good repair. Many of our catenary poles are over 90 years old and are beyond their design service life. Replacement of the network of catenary poles provides physical support to the power transmission and catenary systems and is an integral part of those systems.

Location: Linecode - AP, milepost 79.9. PRIIA segment 22.

FAST Act Category:
- Normalized Replacement

Also Supports:
- Backlog Capital Replacement
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority: 13

Project Benefits:
-Safety
-Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101690 Total
\$1,500,000	\$3,625,000	\$2,000,000	\$2,000,000	\$2,000,000	\$2,000,000	\$13,125,000

C.EN.101787 - KEARNY-WAVERLY REPL TRANSMISSION TOWERS
Design and construction of six new monopole structures that carry the four transmission circuit lines from Kearney Substation at MP 7.2 over the Passaic River to Waverly Substation (MP 12.2).

Location: Linecode - AN, milepost 12.2. PRIIA segment 12.

FAST Act Category:
- Normalized Replacement

Also Supports:
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority: N/A

Project Benefits:
-Safety
-Journey Time Capability
-SOG
-Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101787 Total
\$250,000	\$5,322,690	\$4,000,000	\$0	\$0	\$0	\$9,572,690

C.EN.101695 - AMTRAK NEC CONST TENSION CATENARY UPGRS
Upgrades to the constant tension catenary system. Upgrades include but are not limited to overhead bridge modifications, overhead bridge icicle mitigation, or general hardware replacement.

Location: Linecode - AB, milepost 185.1. PRIIA segment 2.

FAST Act Category:
- Normalized Replacement
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority: 13

Project Benefits:
-Safety
-Journey Time Capability
-SOG
-Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101695 Total
\$600,000	\$1,250,000	\$1,250,000	\$1,250,000	\$1,200,000	\$1,200,000	\$6,750,000

<p>C.EN.101535 - HACKENSACK SUB 42 NEW CONTROL HOUSE</p> <p>Design, construct, install, and commission a new Control House for Hackensack sub 42. The project will include all required cut-over, demolition, testing/ commissioning work to provide a complete functional control house for Substation 42. The project will also include all required site work associated with the installation of the new control house including grounding work, construction of retaining walls for leveling of the installation area and ancillary work required to construct the project. The project will obtain Section 106/ NEPA requirements and approval prior to construction.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> -Safety -Journey Time Capability -SOG -Resilience
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Location: Hackensack Substation. PRIIA segment 12.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101535 Total
\$1,500,000	\$5,523,829	\$2,656,068	\$0	\$0	\$0	\$9,679,897

C.EN.100410 - NEW BRUNSWICK-TRENTON NJHSRIP CATENARY

Design modifications to the catenary system that supplies power to trains to support higher operating speeds and higher levels of service. Intermediate catenary support structures will be installed over a distance of approximately 23 miles within this territory to shorten catenary spans. New catenary appliances will be installed on all four tracks in the targeted section of the NEC right-of-way. Additionally, replacement of existing catenary poles may be required to support increased track centers required for higher operating speeds. As Amtrak is proposing a Next-Generation High Speed Rail upgrade to the NEC in the next several years, it will endeavor to design the catenary system so as not to preclude future accommodation of catenary structures and support for future expansion of capacity and higher speed service. Modifications to the overhead catenary system include installation of a more reliable constant-tension catenary system that will replace the existing fixed-tension catenary system on all four mainline tracks between County Interlocking, MP 32.8 (south of New Brunswick, NJ) and Ham Interlocking, MP 55.7 (just north of Trenton, NJ). Accompanying the new intermediate support structures for overhead wires will be a system of pulleys and counterweights.

FAST Act Category:
 - Major Backlog
 - Improvements to Support Service Enhancements or growth
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program Priority:
 12

Project Benefits:
 -Journey Time Capability
 -SOG
 -Resilience

Location: Linecode - AN, milepost 32.8 to 55.7. PRIIA segment 12.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100410 Total
\$21,804,700	\$4,131,040	\$0	\$0	\$0	\$0	\$25,935,740

C.EN.101693 - AMTRAK NEC TRANSMISSION LINE UPGRADES

Renew transmission hardware components including replacement of transmission wire and renewal of transmission components (i.e. insulators, arms, attachments, etc.)

Location: Linecode - AP, milepost 0. PRIIA segment 17.

FAST Act Category:
 - Normalized Replacement

Also Supports:
 - Improvements to Support Service Enhancements or growth
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program Priority:
 15

Project Benefits:
 -Safety
 -Journey Time Capability
 -SOG
 -Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101693 Total
\$825,000	\$925,000	\$950,000	\$950,000	\$950,000	\$950,000	\$5,550,000

<p>C.EN.101747 - METUCHEN FREQ CONVERTER EQUIPMENT UPGRS</p> <p>Design and construction for improvement of the rotary frequency converter at the Metuchen Frequency Converter Station in Metuchen NJ. The Metuchen Rotary Frequency Converter is required to function in order for Amtrak's Electric Traction department to provide traction power to the 25Hz power system. Amtrak has entered into an agreement with PECO to reimburse PECO for the actual cost of major repairs, major parts replacement and capital expenditures. The scope includes upgrades to control room, MG set room, hydraulic system (Basement), 11kv switchgear interface, and vibration monitoring system. PECO will provide engineering services, project management, installation, procurement, construction and start up and commissioning for the project. Amtrak's Project Manager will reviews of design, construction and technical documents, project invoices, conduct field/site visits to verify work is being performed in accordance with plans and specifications.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements <p>Also Supports:</p> <ul style="list-style-type: none"> - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority:</p> <p>N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> -Safety -Journey Time Capability -SOG -Resilience
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Location: Linecode - AN. Metuchen. PRIIA segment 12.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101747 Total
\$4,500,000	\$3,000,000	\$0	\$0	\$0	\$0	\$7,500,000

<p>C.EN.100331 - ELECTRIC TRACTION DESIGN REVIEW</p> <p>Design support for major projects both from inside the ET department and from other departments and agencies within and outside of Amtrak.</p> <p>Location: NEC wide (Engineering Design Support)</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority:</p> <p>N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> -Safety -SOG
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100331 Total
\$440,000	\$800,000	\$460,000	\$470,000	\$470,000	\$510,000	\$3,150,000

C.EN.100618 - CAT ET TRAINING FACILITY UPGR
Upgrades to the E.T. training facilities on the NEC. These locations include Penn Coach Yard , Sunnyside Yard, Baltimore, Princeton Junction, and Midway. Each facility will have different upgrades: Philadelphia - This facility was designed and constructed during the NECIP project. We need to upgrade the facility to comply with the current OSHA safety standards. Also the facility will be expanded to accommodate the increased number of trainees. Sunnyside Yard - placing new trailers, were none existed before and installing utilites to the trailers. Work at other locations will be done in subsequent fiscal years.

FAST Act Category:
- Normalized Replacement
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
-Safety

Location: NEC Wide

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100618 Total
\$175,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$1,175,000

C.EN.101686 - AMTRAK NATIONAL CATENARY POLE UPGRADES
Renewal and replacement of existing catenary poles, associated hardware, foundations, and guy wire supports that are not currently in a state of good repair. Many of our catenary poles are over 90 years old and are beyond their design service life. Replacement of the network of catenary poles provides physical support to the power transmission and catenary systems and is an integral part of those systems.

FAST Act Category:
- Normalized Replacement

Also Supports:
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
-Safety
-Journey Time Capability
-SOGR
-Resilience

Location: NEC wide

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101686 Total
\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$600,000

C.EN.101611 - ELECTRIFIED TERRITORY FALL PROTEC STUDY
As a result of changes in OSHA Fall Protection regulations which went into effect in April 2015, Amtrak can no longer free climb when working at heights above 4 feet without 100% fall protection. Therefore, Amtrak has initiated and completed in October of 2015 a fall hazard assessment of the entire electrification system on the Northeast Corridor. The recommendations generated from the study will be used to implement changes to Amtrak's current fall protection policies, standards and work practices.

FAST Act Category:
- Safety & Mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
-Safety

Location: NEC wide

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101611 Total
\$740,000	\$90,000	\$90,000	\$90,000	\$90,000	\$90,000	\$1,190,000

<p>C.EN.101517 - ET EMPLOYEE ARC FLASH PROTECTION</p> <p>Assessment of the arc-flash requirements for Amtrak's Electric Traction system and the associated substations, converter stations and signal locations to determine minimum arc flash boundaries and the required personal protective equipment when entering/performing duties at these locations.</p> <p>Location: NEC wide.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Safety & Mandates - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> -Safety -Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101517 Total
\$250,000	\$0	\$0	\$0	\$250,000	\$0	\$500,000

<p>C.EN.101431 - MD051.43 RT 272 CATENARY IMPROVEMENTS</p> <p>MSHA is funding its Bridge Replacement Project above Amtrak's railroad tracks. The project includes the removal of the existing bridge over Route 272 and the installation of a new bridge structure. The project also includes the detachment of catenary from the existing bridge and the installation of new catenary structures.</p> <p>Location: Linecode - AP, milepost 51.3. PRIIA segment 21.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements - Strategic Initiatives that improve operational performance, lower cost or improve efficiency <p>Also Supports:</p> <ul style="list-style-type: none"> - Normalized Capital Replacement 	<p>Construction Program</p> <p>Priority: 3</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> -Safety -SOGR -Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101431 Total
\$1,200,000	\$0	\$0	\$0	\$0	\$0	\$1,200,000

<p>C.EN.101434 - LEVITTOWN PA STA-CATENARY MODIFICATIONS</p> <p>Modifications to the existing catenary structures, overbuild feeders, and support foundations; raising transmission wires; flagging protection and review support services at the Levittown, PA train station. These modifications are in conjunction with SEPTA station improvements.</p> <p>Location: Linecode - AN, milepost 63.1. PRIIA segment 14.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> -Safety -Journey Time Capability -SOGR -Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101434 Total
\$100,000	\$0	\$0	\$0	\$0	\$0	\$100,000

C.EN.101591 - NEW ENG DIV SHORELN EAST ELECTRIFICATION

Install catenary over the existing passing siding tracks at the Guilford Track 4, Old Saybrook Track 3, and New London Track 6. as part of the CT DOT Shore Line East Electrification Improvements and to enable operating M8 equipment for Shore Line East train service from New Haven to New London, CT. The tracks at these stations are used by existing diesel equipment for the Shore Line East commuter trains.

FAST Act Category:
 - Improvements
 - Improvements to Support Service Enhancements or growth
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
 6

Project Benefits:
 -Resilience

Location: Linecode - AB, Guilford, Old Saybrook and New London. PRIIA Segment: 5.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101591 Total
\$2,200,000	\$0	\$0	\$0	\$0	\$0	\$2,200,000

C.EN.101715 - PA013.49 MARKET ST CATENARY IMPROVEMENTS

Replacement of Market Street Bridge by PennDOT. Amtrak's Catenary is currently attached to the existing bridge and will need to be relocated to new catenary structures to allow for the bridge replacement

FAST Act Category:
 - Improvements
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
 6

Location: Linecode - AP, milepost 17. PRIIA segment 19.

Also Supports:
 - Normalized Capital Replacement

Project Benefits:
 -Safety
 -Journey Time Capability
 -SOG
 -Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101715 Total
\$300,000	\$0	\$0	\$0	\$0	\$0	\$300,000

C.EN.101764 - PA086.36 MONTGOMERY AVE CATENARY IMPRV

Construction of new catenary structures and relocation of existing catenary attached to the Montgomery Ave Bridge which is being replaced by City of Philadelphia.

FAST Act Category:
 - Improvements
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
 N/A

Location: Linecode - AN, milepost 86.36. PRIIA segment 16.

Also Supports:
 - Normalized Capital Replacement

Project Benefits:
 -Safety
 -Journey Time Capability
 -SOG
 -Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101764 Total
\$200,000	\$0	\$0	\$0	\$0	\$0	\$200,000

C.EN.100347 - SAFE HARBOR FREQ CONVERT UPGR Replace and upgrade the frequency converter at Safe Harbor, MD generating station - including rewind of the stator; re-alignment of the machines; provision of new electrical (power and control) equipment (cables, breakers, excitation system, etc.); thorough cleaning; and testing/ commissioning. The original 2 water wheels and the 1 rotary frequency converter (RFC) were installed in the 1930's. The water wheels were previously rehabilitated in the 1970's and the RFC was previously rehabilitated in mid-2000.						
FAST Act Category: - Normalized Replacement						
Also Supports: -Improvements to Support Service Enhancements or growth -Strategic Initiatives that improve operational performance, lower cost or improve efficiency						
Construction Program Priority: N/A Project Benefits: -Safety -Journey Time Capability -SOGR -Resilience						
Location: NEC wide						
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100347 Total
\$4,217,457	\$0	\$0	\$0	\$0	\$0	\$4,217,457

Electric Traction Capital Program – NEC Branch Line						
C.EN.101785 - CONESTOGA-ROYALTON REPLACE TRANS LINE Design and construction of 29 miles of the 11 Line Transmission from Conestoga to Royalton substations. Design services include concept design (15%) as well as 30%, 60%, 90%, and 100% design submissions and Construction Phase Services.						
FAST Act Category: - Normalized Replacement						
Also Supports: - Backlog Capital Replacement - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency						
Construction Program Priority: N/A Project Benefits: -Safety -Journey Time Capability -SOGR -Resilience						
Location: Linecode - AH. PRIIA segments, 28,29 and 30.						
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101785 Total
\$500,000	\$4,649,950	\$22,345,864	\$14,016,617	\$0	\$0	\$41,512,431

<p>C.EN.101786 - CONESTOGA STEPUP YARD 25Hz EQUIP UPGRS</p> <p>Acquisition of 25Hz equipment at Conestoga Step-Up Yard. Currently the Conestoga Step-Up Yard is owned by PPL. These upgrades to equipment will be required once the Conestoga Step-Up Yard is acquired.</p> <p>Location: Linecode - AH. PRIIA segments, 28,29 and 30.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> -Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101786 Total
\$500,000	\$4,000,000	\$7,000,000	\$4,000,000	\$0	\$0	\$15,500,000

<p>C.EN.101662 - AMTRAK NATIONAL SUBSTATION UPGRADES</p> <p>Improvements to electric traction substation components to include air brakes, breakers, remote terminal units, control house renovations, substation lighting, fencing, etc. as needed based on inspection and testing of the various components.</p> <p>Location: Linecode - AH, milepost 0. Harrisburg Line. PRIIA segment 28.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: 11</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> -Safety -Journey Time Capability -SOGR -Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101662 Total
\$4,150,000	\$1,700,000	\$1,700,000	\$1,700,000	\$1,700,000	\$1,700,000	\$12,650,000

<p>C.EN.101663 - AMTRAK NATIONAL CATENARY HDWARE RENEWAL</p> <p>Replacement of the overhead catenary and hardware such as but not limited to wire, insulators, rods, and clips.</p> <p>Location: Linecode - AH, milepost 20.2. Harrisburg Line. PRIIA segment 29.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement <p>Also Supports:</p> <ul style="list-style-type: none"> - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: 13</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> -Safety -SOGR
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101663 Total
\$250,000	\$250,000	\$1,050,000	\$1,050,000	\$1,050,000	\$1,050,000	\$4,700,000

C.EN.101665 - AMTRAK NATIONAL SIGNAL POWER UPGRADES Replacement and renewal of the existing rotary signal power machines that generate the 6,900 volts for the signal transmission lines. This equipment runs 24 hours a day, seven days a week, has many rotating parts and requires extensive maintenance. Another example of work provided under this program includes the upgrade of the open signal power wire to insulated cable at key locations. Location: Linecode - AH, milepost 0. Harrisburg Line. PRIIA segment 28.						
			FAST Act Category: - Normalized Replacement Also Supports: - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: 12 Project Benefits: -Safety -Journey Time Capability -SOGR -Resilience	
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101665 Total
\$150,000	\$550,000	\$950,000	\$550,000	\$150,000	\$150,000	\$2,500,000
C.EN.101666 - AMTRAK NATIONAL TRANSMISSION LINE UPGRS Renew transmission hardware components including replacement of transmission wire and renewal of transmission components, i.e. insulators, arms, attachments, etc. Location: Linecode - AH, milepost 0. Harrisburg Line. PRIIA segment 28.						
			FAST Act Category: - Normalized Replacement Also Supports: - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: 15 Project Benefits: -Safety -Journey Time Capability -SOGR -Resilience	
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101666 Total
\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$2,400,000

Electric Traction Capital Program – Significant Projects

C.EN.201264 - ZOO-PAOLI CATENARY POLE DESIGN

Upgrade the catenary structure and new transmission line installation design. The project will consist of the design for the upgrade of the original Philadelphia to Paoli catenary structures that are nearing 100 years old. As a part of the upgrade of the new structures will support a new 138 kV transmission line to connect Paoli Substation with Zoo Substation. The design will include a new replacement step-down substation at Bryn Mawr (Currently, Bryn Mawr is a switching station, not a substation.)

FAST Act Category:

- Normalized Replacement
- Improvements to Support Service Enhancements or growth

Also Supports:

- Normalized Capital Replacement
- Backlog Capital Replacement

Construction Program

Priority: N/A

Project Benefits:

- Safety
- Journey Time Capability
- SOG
- Resilience

Location: Linecode - AN, Bryn Mawr. PRIIA segment 16.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.201264 Total
\$75,000	\$25,118,443	\$32,455,027	\$32,584,330	\$32,455,027	\$32,000,000	\$154,687,827

C.EN.101765 - CLARK-HAM CONSTANT TENSION CATENARY

Replacement of ET Infrastructure between MP 48.5 and MP 55.7 (approximately CP Clark to Ham I/L) on the AN line, bringing 28 miles of catenary and 160 catenary structures up to a State of Good Repair (SoGR). The project will extend the constant tension section of catenary that was recently installed (MP 41.57 to MP 48.5) through to MP 55.7 (Ham Interlocking) and will enable an increase of operating speeds to 160 mph for Acela Trains by upgrading the existing fixed termination catenary to constant tension. Improvements to the Overhead Contact System (OCS) include replacement of existing circa 1932 fixed termination catenary with new constant tension catenary for approximately 7 route miles of four track mainline (28 miles of catenary). The project will also install 160 new catenary structures (poles/portal beams/cantilever structures) along with the associated structure and guy foundations to replace the existing structures which have fallen into a state of disrepair since their installation in 1931. The specific assets that will be constructed include the following: 465 Foundations (structures and down guys); 154 Catenary Portal Structures (2 poles/structure = 308 poles); 154 Portal Beams (requires 4 track outage); 6 Catenary Cantilever Structures (1 pole/structure); 28 Track Miles New Catenary; and Removal of 134 existing catenary structures.

FAST Act Category:
 - Improvements
 - Improvements to Support Service Enhancements or growth
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Also Supports:
 - Normalized Cap. Replacement
 - Backlog Cap. Replacement

Construction Program
 Priority:
 N/A

Project Benefits:
 -Safety
 -Journey Time Capability
 -SOGR
 -Resilience

Location: Linecode - AN, milepost 48.5 to 55.7. PRIIA segment 12.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101765 Total
\$7,000,000	\$46,890,000	\$39,070,000	\$33,890,000	\$28,430,000	\$12,510,000	\$167,790,000

Communications and Signals – FY19 to FY24 Constrained Capital Program

Communications and Signals Capital Program – NEC Main Line

C.EN.101753 - WAS-PSNY UPGRADE SIGNAL SYSTEM TO 562

Signal upgrades to address SOGR needs and improve performance and reliability for all users.

Location: NEC - Washington to New York. PRIIA segments 12-23.

FAST Act Category:
- Improvements

Also supports:
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program

Priority:
13

Project Benefits:
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101753 Total
\$6,905,877	\$10,705,877	\$12,500,000	\$13,000,000	\$16,000,000	\$14,000,000	\$73,111,754

C.EN.101740 - AMTRAK NEC SW CONVERSION AIR TO ELECTRIC

Conversion of air switch machines to electric machines, to address SOGR needs and improve operational performance.

Location: NEC wide.

FAST Act Category:
- Improvements
-

Construction Program

Priority:
N/A

Project Benefits:
- Safety

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101740 Total
\$150,000	\$0	\$0	\$0	\$0	\$0	\$150,000

C.EN.201034 - PTC AMTRAK OWNED INSTALLATION

Installation of Positive Train Control on the Amtrak system. This includes upgrades to CIH's, radio transmission equipment, and wayside interface units.

Location: NEC wide.

FAST Act Category:

- Safety & Mandates
- Statutory, regulatory, or other legal mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program

Priority:
15

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.201034 Total
\$8,451,496	\$10,400,000	\$5,000,000	\$2,000,000	\$4,000,000	\$10,000,000	\$39,851,496

<p>C.EN.101726 - CETC AMTRAK NEC ADVANCED TRAIN CONTROL</p> <p>The scope of this NEC program is to bring the Centralized Electrification and Traffic Control (CETC) asset class to a complete state of good repair. The work will include the rehabilitation, replacement or upgrades to various components of the Communications & Signals CETC network infrastructure located on the Northeast Corridor, between Washington, DC, and Boston, MA.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement - Strategic Initiatives that improve operational performance, lower cost or improve efficiency - Statutory, regulatory, or other legal mandates 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - SOGR - Resilience
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Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101726 Total
\$1,942,500	\$2,633,550	\$2,020,000	\$1,356,000	\$1,420,000	\$2,300,000	\$11,672,050

<p>C.EN.100676 - Q INT- DESIGN AND REPLACE C&S EQUIPMENT</p> <p>The Q Interlocking C&S Equipment Replacement Project for Phase 1 is to perform preliminary construction to support the retirement of Q Tower by installing a new Central Instrument House (CIH) and Communications Bungalow. This will be accomplished by performing the construction necessary to route fiber cable between the new Q CIH and the HSR control tower and new QRT house. A signal cable route must also be established between the Q CIH and QTW and QTE cases and to provide cable paths between QRT House and local control appliances. In addition, construction of foundations for the CIH and the Communications Bungalow will be completed and interface cases adjacent to QTW and QTE cases will be built and set to provide a quick transition between existing and future infrastructure. Project Deliverables for Phase 1 of is comprised of the following: heavy construction, trenching and cross track digs to route fiber cable to the high speed rail building and new QRT house; construction of the foundation for the CIH (Central Instrument House); construction of cable paths from the new CIH to QW and QE cases; construction of cable paths from the QRT house, which controls the new ready tracks to local control appliances; set case for Communications Bungalow; and set interface cases adjacent to QTW and QTE.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - SOGR - Resilience
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Location: Linecode - AT, milepost 3.1. PRIIA segment 9.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100676 Total
\$3,200,000	\$3,000,000	\$3,000,000	\$0	\$0	\$0	\$9,200,000

C.EN.100846 - WAS-NYP REDUNDANT COMM CABLE
 Replace existing copper communication cable with next generation cable and add a fiber cable for redundancy on the NEC from Washington to New York. Install new termination equipment for these cables. It is necessary to use the existing communications cable as a pull cable for installation of the replacement copper cable and the new fiber cable.

Location: NEC - Washington to New York. PRIIA segments 12-23.

FAST Act Category:
 - Normalized Replacement
 - Improvements to Support Service Enhancements or growth
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Also Supports:
 - Normalized Capital Replacement

Construction Program Priority:
 11

Project Benefits:
 - SOGR
 - Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100846 Total
\$1,500,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$6,500,000

C.EN.100562 - AMTRAK NEC MAD SOUTH INTERLOCKING UPGRS
 Address interlocking signal system components not currently in a state of good repair. Some of the work performed under this program includes conversion of air switch machines to electric machines, automation of manual towers and replacement of various obsolete interlocking signal system components.

Location: NEC - Mid-Atlantic Division.

FAST Act Category:
 - Improvements

Also Supports:
 - Improvements to Support Service Enhancements or growth
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program Priority:
 13

Project Benefits:
 - SOGR
 - Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100562 Total
\$750,000	\$575,000	\$1,325,000	\$750,000	\$1,000,000	\$1,500,000	\$5,900,000

C.EN.101474 - AMTRAK NEC NYD WEST INTERLOCKING UPGRS
 INT Install Recorders - New York Division. Install new recorders at interlockings on the New York Division.

Location: NEC - New York Division. PRIIA segment 12.

FAST Act Category:
 - Improvements

Also Supports:
 - Backlog Cap. Replacement
 - Improvements to Support Service Enhancements or growth
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program Priority:
 N/A

Project Benefits:
 - Safety
 - Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101474 Total
\$1,200,000	\$1,205,000	\$1,405,000	\$1,405,000	\$1,405,000	\$1,955,000	\$8,575,000

C.EN.101779 - SCADA SECURITY UPGRADES

The Supervisory Control Data Acquisition (SCADA) Replacement Project will upgrade the New York Power Directors SCADA, Wilmington Power Directors SCADA, New England Power Directors SCADA and Philadelphia Load Dispatchers SCADA systems. Currently three different SCADA systems operate and control the Electric Traction power generation and distribution system for Amtrak's Northeast Corridor (NEC). This project will combine all the three under one system, enabling remote redundancy and operational flexibility. The project will also provide contingency options in the event of a critical issue impacting an operations center. The SCADA system manages all the ET infrastructure and equipment in the New England Division (NED), New York Division (NYD) and the Mid-Atlantic Division (MAD). This includes managing 440MW of generation, 160 transformers, and 490 miles of railroad. There are 9 personnel monitoring and managing this equipment 24/7. Upgrading SCADA to one common system will provide flexibility to update the system on demand as field changes occur, to provide remote redundant servers to increase system resiliency and provide for a platform compatible with the CETC train dispatching system. This project will reduce long term costs by enabling Amtrak personnel to modify graphics and database mapping as required to ensure PDs are operating from the most current system. It will install off-site redundant servers to ensure the system stays operational in the event a critical issue or failure occurs.

FAST Act Category:

- Improvements
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program

Priority:
N/A

Project Benefits:
- Safety

Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101779 Total
\$500,000	\$2,500,000	\$3,500,000	\$2,400,000	\$0	\$0	\$8,900,000

C.EN.101418 - NEW ENGLAND DIV SUBSTA SCADA-RTU UPGRS

Upgrade and component replacement of SCADA-RTU equipment at substations to address SOGR needs and improve safety and reliability.

Location: NEC - New England Division. PRIIA segments 1 and 2.

FAST Act Category:

- Improvements

Also Supports:

- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program

Priority:
12

Project Benefits:
- Safety

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101418 Total
\$1,255,000	\$1,255,000	\$1,255,000	\$1,255,000	\$1,255,000	\$1,255,000	\$7,530,000

C.EN.100563 - AMTRAK NEC MAD NORTH INTERLOCKING UPGRS

Address interlocking signal system components not currently in a state of good repair. Some of the work performed under this program includes conversion of air switch machines to electric machines, automation of manual towers and replacement of various obsolete interlocking signal system components.

Location: NEC - Mid-Atlantic Division

FAST Act Category:
- Improvements

Also Supports:
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
12

Project Benefits:
- SOGR
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100563 Total
\$1,200,000	\$1,915,000	\$1,305,000	\$1,105,000	\$1,105,000	\$1,345,000	\$7,975,000

C.EN.101743 - NEW YORK DIV EAST INTERLOCKING UPGRS
The scope of this Northeast Corridor program is to address interlocking signal system components not currently in a state of good repair. Some of the work performed under this program includes conversion of air switch machines to electric machines, automation of manual towers and replacement of various obsolete interlocking signal system components.

Location: NEC - New York Division. PRIIA segments 9 and 10.

FAST Act Category:
- Normalized Replacement

Construction Program
Priority:
11

Project Benefits:
- Safety
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101743 Total
\$300,000	\$1,150,000	\$500,000	\$500,000	\$500,000	\$900,000	\$3,850,000

C.EN.101767 - WAS-BOS CETC ARINC TO AMTEC SOFTWARE

The Washington to Boston ARINC to AMTEC Software Upgrade Project will replace the MAD and NED CETC primary and backup system with the AMTEC system. The project will be design, implement and test the new MAD and NED AMTEC systems by in-house PSCC staff as well as maintenance of all system interfaces. Transportation personnel in Wilmington, Boston and Remote locations will be able to transfer their operations to the new system. Power Director and Load Dispatcher operations will continue, either by a newly selected system by Electric Traction (E/T) personnel or by the existing system. The project will provide training on the new system to both Transportation and CETC specialists.

Location: NEC wide.

FAST Act Category:
- Improvements

Also Supports:
- Normalized Capital Replacement
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101767 Total
\$3,650,000	\$5,194,913	\$0	\$0	\$0	\$0	\$8,844,193

C.EN.101701 - AMTRAK NEC C&S INTERLOCKING UPGRADES

The scope of this Northeast Corridor program is to address interlocking signal system components not currently in a state of good repair. Some of the work performed under this program includes conversion of air switch machines to electric machines, automation of manual towers and replacement of various obsolete interlocking signal system components.

Location: NEC wide.

FAST Act Category:
- Normalized Replacement

Also Supports:
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program
Priority:
N/A

Project Benefits:
- Safety

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101701 Total
\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$6,000,000

C.EN.101744 - NEW ENGLAND DIV WEST INTERLOCKING UPGRS

The scope of this Northeast Corridor (New England Division West) program is to address interlocking signal system components not currently in a state of good repair. Some of the work performed under this program includes conversion of air switch machines to electric machines, automation of manual towers, replacement of various obsolete interlocking signal system components, conversion of mechanical components to electrical components, replacement of deteriorated cable and track wires and conversion of color light signals to Light Emitting Diode (LED) units.

Location: NEC - New England Division

FAST Act Category:
- Improvements

Also Supports:
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
12

Project Benefits:
- Safety
- Journey Time Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101744 Total
\$400,000	\$599,000	\$832,000	\$726,000	\$800,000	\$800,000	\$4,157,000

C.EN.101751 - INT NEW ENGLAND DIV EAST INTERLOCKING

The scope of this NEC program is to bring the Automatic Block Signal (ABS) asset class to a complete state of good repair. Much of the work requires conversion of mechanical components to electrical components, replacement of deteriorated cable and track wires and conversion of color light signals to Light Emitting Diode (LED) units.

Location: NEC - New England Division

FAST Act Category:
- Normalized Replacement

Also Supports:
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
12

Project Benefits:
- Safety
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101751 Total
\$270,000	\$1,050,000	\$1,590,000	\$1,490,000	\$1,190,000	\$1,225,000	\$6,815,000

C.EN.101732 - AMTRAK NEC - RADIO SYSTEM UPGRADES
The project will investigate and remediate poor radio coverage in areas that may create a safety hazard for our ROW employees.

Location: NEC wide.

FAST Act Category:
- Normalized Replacement
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program
Priority:
12

Project Benefits:
- Safety
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101732 Total
\$500,000	\$500,000	\$500,000	\$500,000	\$200,000	\$200,000	\$2,400,000

C.EN.101354 - C&S SYSTEM - NETWORK UPGRADES
NET Replace as Req - NETWORK UPGRADES

Replace obsolete telecommunications routing equipment with up to date equipment

Location: NEC wide.

FAST Act Category:
- Normalized Replacement

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- Journey Time Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101354 Total
\$250,000	\$500,000	\$1,500,000	\$500,000	\$150,000	\$150,000	\$3,050,000

C.EN.100081 - CETC NY SCADA PHASE II
The Supervisory Control Data Acquisition (SCADA) Replacement Project will upgrade the New York CETC SCADA systems.

Location: Penn Station, NY. PRIIA Segment 11.

FAST Act Category:
- Normalized Replacement
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program
Priority:
N/A

Project benefits:
- Safety

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100081 Total
\$2,000,000	\$0	\$0	\$0	\$0	\$0	\$2,000,000

C.EN.100727 - DAVISVILLE I/L MICROLOK 2 UPGR
Replace Microlok I and associated equipment with Microlok II at Davisville Interlocking. Davisville Interlocking is a three track interlocking with a single crossover to a

FAST Act Category:
- Major Backlog

Also Supports:

Construction Program
Priority:
N/A

siding track and a high speed universal crossover between the two main tracks. There is a Central Instrument House (CIH) as well as an A and B instrument house. A non-vital Genisys processor and local control panel are located in the CIH. A Vital Microlok I and Microlok plus microprocessor system consisting of eight processors zoned for Tracks 1, 2 and 6 are installed in the CIH, A and B locations. The instrument houses and the majority of equipment remain in a state of good repair, however all microprocessors are beyond their useable life and require replacement.

- Normalized Capital Replacement
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Project Benefits:
- SOGR
- Journey Time Capability

Location: Linecode - AB, milepost 168. PRIIA segment 3.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100727 Total
\$1,100,000	\$100,000	\$0	\$0	\$0	\$0	\$1,200,000

C.TR.100074 - NED STA TRAIN APPROACH MESSAGE SYSTEM

Replacement of train approach messaging systems at stations.

Location: NEC - New England Division.

FAST Act Category:
- Improvements

Also Supports:
- Normalized Capital Replacement
- Improvements to Support Service Enhancements or growth

Construction Program
Priority:
N/A

Project Benefits:
- SOGR
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.TR.100074 Total
\$450,000	\$0	\$0	\$0	\$0	\$0	\$450,000

C.EN.100478 - C&S LANCASTER SHOP EQI UPGR

Planned upgrades include: 1. Upgrade Shop Lighting to LED Fixtures; 2. Install New Fire Alarm Panel and Sensors; 3. Install New Garage Doors; 4. Upgrade Security System; 5. Install 100 HZ Outlet at Rear of Building; 6. Install Water Faucet at Rear of Building

Location: Lancaster C&S Shop. PRIIA segment 19.

FAST Act Category:
- Normalized Replacement
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100478 Total
\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$1,200,000

<p>C.EN.100788 - NORTHEAST CORRIDOR RADIO VOTER UPGRADES</p> <p>With the conversion to FCC required narrow banding, radio coverage will become an issue as signal strength is restricted by bandwidth. Engineering work (including a coverage study) and design are needed to insure adequate coverage along the right of way. As a part of maintaining adequate radio coverage C&S will needs to add additional and replace the existing analog radio voters (quality signal selector) with state of the art voters on the North East Corridor</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement - Statutory, regulatory, or other legal mandates - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - SOGR - Resilience
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Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100788 Total
\$300,000	\$175,000	\$175,000	\$175,000	\$0	\$0	\$825,000

<p>C.EN.100407 - NEW BRUNSWICK-TRENTON NJHSRIP SIGNALS</p> <p>Signal upgrades along a 23-mile section of track between Trenton and New Brunswick, New Jersey to support faster, more reliable and more frequent service for all NEC users. The project will overhaul track infrastructure providing modern infrastructure that will allow Acela services to reach 160 mph, their highest speed anywhere on the NEC.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Major Backlog - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: 12</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - SOGR - Resilience
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Location: Linecode - AN, milepost 32.8 to 55.7. PRIIA segment 12.

Also Supports:

- Normalized Capital Replacement

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100407 Total
\$1,438,900	\$335,544	\$0	\$0	\$0	\$0	\$1,774,444

<p>C.EN.101510 - NED ENERGY EFFICIENT SWITCH HEATER REPL</p> <p>SWHT - Multi- year program by State for NED to replace existing switch heaters with new energy efficient switch heaters to save significant operating and replacement costs. The various utilities (NSTAR, GRID, CL&P, etc.) may subsidize and provide some sort of rebate. Eleven interlockings in each state - MA, RI and CT on the NEC. (MRS is not included)</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - SOGR - Resilience
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Location: NEC - New England Division

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101510 Total
\$310,427	\$300,000	\$0	\$0	\$0	\$0	\$610,427

<p>C.EN.101537 - NEC PTC SECURE WIRELESS COMMUNICATION</p> <p>Research and development of secure wireless network communications for PTC. Development of a plan to implement the secure wireless communications within 18 months of award of Grant. There will be interoperability with railroads that operate on the NEC. Once the specifications are fully developed, we will implement, test and commission the design.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Safety & Mandates - Strategic Initiatives that improve operational performance, lower cost or improve efficiency - Statutory, regulatory, or other legal mandates 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety
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Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101537 Total
\$1,485,966	\$243,000	\$0	\$0	\$0	\$0	\$1,728,966

<p>C.EN.101426 - MAD COMM SHELTER ALARM SYSTEM UPGRS</p> <p>MAD SNMP Housekeeping Alarm Panels (Comm Shelters)</p> <ul style="list-style-type: none"> - This project will install and configure SNMP alarm panels to proactively monitor site power, temperature, and intrusion over the network infrastructure. Alarms will be configured in our existing servers and centrally monitored in the Communication's Control Center. 	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements 	<p>Construction Program</p> <p>Priority: 10</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Journey Time Capability - SOGR - Resilience
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Location: NEC - Mid-Atlantic Division

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101426 Total
\$100,000	\$100,000	\$100,000	\$0	\$100,000	\$0	\$400,000

<p>C.EN.101714 - MOFW ENHANCED EMPLOYEE PROTECTION SYSTEM</p> <p>Implement a system to enhance roadway worker protection when working on track under foul time or track out of service. The system will provide roadway workers with an authorization code that corresponds to the blocking protection applied in the CETC control system. Removal of the protection by the CETC train dispatcher will require the authorization code be provided by the roadway worker. The system will utilize modifications to the CETC System platform functionality and mobile devices assigned to roadway workers.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - SOGR - Resilience
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Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101714 Total
\$210,000	\$0	\$0	\$0	\$0	\$0	\$210,000

<p>C.EN.101415 - RADIO SITE BACKUP - EMERGENCY PWR UPGRS</p> <p>Radio Site Backup and Emergency Power. - We are looking to bring all radio site backup power systems to a good state of repair and a higher standard than is typically deployed. We are also looking to equip the radio support locations with sufficient generators to address commercial power outages.</p> <p>Location: NEC wide.</p>	<p>FAST Act Category: - Normalized Replacement</p> <p>Also Supports: - Strategic Initiatives that improve operational performance, lower cost or improve efficiency</p>	<p>Construction Program Priority: N/A</p> <p>Project Benefits: - Safety - Journey Time Capability - SOGR - Resilience</p>
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101415 Total
\$150,000	\$0	\$0	\$0	\$0	\$0	\$150,000

<p>C.EN.101358 - NEW YORK DIV REPLACE COMM EQUIP HOUSES</p> <p>Replacement of communication equipment houses to address SOGR needs. Procure and install new equipment houses and move existing equipment and cabling into new houses.</p> <p>Location: NEC - New York Division. PRIIA segments 9,10 and 12.</p>	<p>FAST Act Category: - Normalized Replacement</p>	<p>Construction Program Priority: 12</p> <p>Project Benefits: - SOGR - Resilience</p>
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101358 Total
\$100,000	\$0	\$0	\$100,000	\$0	\$100,000	\$300,000

<p>C.EN.101359 - MID-ATLANTIC DIV COMM EQUIPMENT HOUSES</p> <p>Replacement of communication equipment houses to address SOGR needs. Procure and install new equipment houses and move existing equipment and cabling into new houses.</p> <p>Location: NEC - Mid-Atlantic Division</p>	<p>FAST Act Category: - Normalized Replacement</p>	<p>Construction Program Priority: N/A</p> <p>Project Benefits: - SOGR - Resilience</p>
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101359 Total
\$100,000	\$0	\$0	\$100,000	\$0	\$100,000	\$300,000

C.EN.101748 - NEW ENGLAND DIV FIBER OPTIC SYSTEM UPGRS

This project is to upgrade the fiber optic communications cores in Boston and New Haven to meet the growing demands for higher bandwidth services. The upgrade will be performed in phases to avoid disruption of railroad operations and secure a path forward for any required future upgrades. The current system will remain operational throughout the upgrade process.

FAST Act Category:
 - Improvements
 - Improvements to Support Service Enhancements or growth
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
 Priority:
 N/A

 Project Benefits:
 - Safety
 - Journey Time Capability
 - SOGR
 - Resilience

Location: NEC - New England Division.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101748 Total
\$3,000,000	\$100,000	\$0	\$0	\$0	\$0	\$3,100,000

C.EN.101527 - HOST RR TERRITORY I-ETMS PTC NON-WAYSIDE

Nationwide I-ETMS PTC Initialization and Operation - Design, install & test an Interoperable Electronic Train Management System (I-ETMS)-compliant Positive Train Control (PTC) system to perform Amtrak train and crew initialization on host railroads from Amtrak's back-office server in order to operate Amtrak trains on host railroads' PTC territory. This project will include the office, communication, and onboard segments of I-ETMS along with Wi-Fi communication at select locations to the initializing trains. The wayside segment will be provided by the host railroad.

FAST Act Category:
 - Safety & Mandates
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency
 - Statutory, regulatory, or other legal mandates

Construction Program
 Priority:
 15

 Project Benefits:
 - Safety
 - Journey Time Capability
 - SOGR
 - Resilience

Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101527 Total
\$400,000	\$2,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$6,400,000

C.EN.101621 - NEC NORFOLK SOUTHERN I-ETMS INSTALLATION

This project will modify Amtrak locomotive radios with spectrum filters so as to maintain the interoperability of the Amtrak ACSES system and the Norfolk Southern Railroad 1-ETMS system on the Mid Atlantic Division. This project will provide estimates for the requested work from Norfolk Southern Railroad (NSR) that is needed to implement the 1-ETMS system and will coordinate the requested services within Amtrak. The requested NSR services may involve Electric Traction, Communications & Signals, Structures and Track disciplines. This project will jointly test and commission the 1-ETMS system with Norfolk Southern Railroad personnel. This project will integrate 1-ETMS signal material into the Amtrak Materials Management system.

FAST Act Category:

- Safety & Mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program

Priority: 15

Project Benefits:

- Safety
- SOGR
- Resilience

Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101621 Total
\$232,341	\$0	\$0	\$0	\$0	\$0	\$232,341

C.EN.101762 - AMTRAK NEC PTC SPLIT-POINT DERAIL PRGM

These installations will help to prevent rail equipment from entering main line track. The split-point derails will be installed at 30 locations where the main line track speeds are over 90 miles per hour. By FRA Mandate each of these locations will have a Split-Pont Derail with Electrically Locked Hand Thrown switch stand installed.

FAST Act Category:

- Safety & Mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program

Priority: N/A

Project Benefits:

- Safety
- SOGR
- Resilience

Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101762 Total
\$300,000	\$0	\$0	\$0	\$0	\$0	\$300,000

C.EN.100120 - DOCK INTERLOCKING C&S RENEWAL Due to its size, it will take several years to completely replace Dock. The project scope includes the design of two new remote controlled interlockings to replace the existing tower. Dock West will encompass all the switches and signals on the West side of the Passaic River. A new central instrument house (CIH) will house vital microprocessor controllers that will control this portion of the interlocking. All the switch and signal cases will be replaced with new signal houses and cases with all new switch and signal cables and new track wires. All the air operated switch machines and valves will be replaced with new electric machines. New express cables will be installed between the new CIH and the outlying signal cases. The new CIH will be remote controlled from Penn Station Central Control (PSCC) in New York. The east side of the interlocking will also be designed as a stand-alone interlocking. Dock East will include the movable bridge spans and the signals protecting movements over the bridge as well as all other signals and switches on the East side of the Passaic River. A new CIH will be installed along with all new signal houses and cases for the outlying locations, new signal and switch cables and track wires. All switch machines will be converted from air to electric. Dock East will also be remote controlled from PSCC. The gas switch heaters at Dock will be replaced with electric heaters as the signal work is done. This will remove natural gas lines running parallel to the tracks. Location: Linecode - AN, milepost 8.5. PRIIA segment 12.

FAST Act Category:- Major Backlog
Also Supports: -
 Improvements to Support Service Enhancements or growth- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
 N/A
Project Benefits:- SOGR- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100120 Total
\$690,000	\$0	\$0	\$0	\$0	\$0	\$690,000

C.EN.101704 - AMTRAK NEC C&S SWITCH HEATER UPGRADES
 This Northeast Corridor communication and signals program funds the upgrade of the switch heater stations to improve the reliability and serviceability of the equipment and provide reliable winter-time operation to reduce service delays.

Location: NEC wide.

FAST Act Category:
 - Normalized Replacement
Also Supports:
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
 N/A
Project Benefits:
 - SOGR
 - Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101704 Total
\$375,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$1,375,000

C.EN.100119 - NEW CETC CTRL CENTER CETC CONSOLIDATION

The NEC CETC Consolidation Project will consolidate CETC centers in Philadelphia, Boston and New York, CNOC and Amtrak Police Department communications center into a new control center. The project includes design and construction of a new facility for the consolidation of CETC, CNOC and Amtrak Police Department National Communications Center. Replace existing CETC systems in Philadelphia and Boston with a new client-server based system will be located in the new facility.

FAST Act Category:

- Technology & Systems
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program

Priority: N/A

Project Benefits:

- Safety
- SOGR
- Resilience

Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100119 Total
\$5,200,000	\$100,000	\$0	\$0	\$0	\$0	\$5,300,000

C.EN.100649 - PSNY RADIO SYSTEM UPGR DSN AND INSTL Design and renew the radio system throughout Penn Station. This would include new antennas, new cabling, new radio equipment for the four radio systems in use. Integrate the tactical channel used by Amtrak Police into the new system. Correct interference of adjacent radio channels with the channels in use in the station.

FAST Act Category:

- Normalized Replacement
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program

Priority: N/A

Project Benefits:

- Safety
- SOGR
- Resilience

Location: Penn Station, NY. PRIIA Segment 11.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100649 Total
\$100,000	\$0	\$0	\$0	\$0	\$0	\$100,000

C.EN.101417 - IT-POLICE VIDEO BANDWIDTH AUGMENTATION

NEC Bandwidth Augmentation for IT and Police Video. - The Amtrak Police have installed numerous cameras to increase security on the system. Additionally, our IT data communications needs have been growing exponentially. Both of these conditions are driving the need to increase our backbone network bandwidth capacity.

FAST Act Category:

- Police and Emergency Management
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program

Priority: N/A

Project Benefits:

- Safety

Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101417 Total
\$1,500,000	\$100,000	\$0	\$0	\$0	\$0	\$1,600,000

<p>C.EN.101420 - OPERATIONS VOICE RECORDING SYS UPGRS</p> <p>Operations Voice Recording Upgrades - The Amtrak Police and Transportation Departments desire an upgrade to their current voice recording platform. They desire a system that will present all telephone and radio traffic on a single interface.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Technology & Systems - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety
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Location: NEC wide.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101420 Total
\$300,000	\$100,000	\$0	\$0	\$0	\$0	\$400,000

<p>C.EN.101593 - WASHINGTON 1ST ST TUNNEL RADIO IMPRV</p> <p>TELE - Make improvements to the telecommunications system in the Washington 1st Street Tunnel including relocating the radio base stations supporting tunnel communications to outside the south portal; revising the repeater system for conductors and other employees so that operations are similar in function to those in the New York and Baltimore tunnels; extend coverage of the Washington Police repeater into the tunnel, as well as the installation of the Amtrak Police Tactical base radio for a secondary channel within the tunnel; and an improved connection to the DC Fire Department into our existing RADIAX antenna system within the tunnels.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Normalized Replacement - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - SOGR - Resilience
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Location: Linecode - AP, milepost 135.92. PRIIA segment 23.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101593 Total
\$350,000	\$0	\$0	\$0	\$0	\$0	\$350,000

<p>C.EN.101143 - NY EAST RIVER TUNNELS SIGNAL TRANSFMERS</p> <p>Replacement of 12 signal transformers in the East River Tunnels that were damaged during the Hurricane Sandy.</p> <p>Location: East River Tunnel. PRIIA Segment 10.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements <p>Also Supports:</p> <ul style="list-style-type: none"> -Improvements to Support Service Enhancements or growth 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> -Safety -Journey Time Capability -SOGR -Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101143 Total
\$75,000	\$0	\$0	\$0	\$0	\$0	\$75,000

C.CF.100063 - PTC RESERVE 2018

Location: NEC Wide

FAST Act Category:
 - Safety & Mandates
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency
 - Statutory, regulatory, or other legal mandates

Construction Program
 Priority:
 N/A
 Project Benefits:
 - Safety

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.CF.100063 Total
\$0	\$0	\$0	\$0	\$0	\$0	\$0

C.EN.101703 - TEL AMTRAK NEC - COMMUNICATION SYSTEM UPGRADES
 Upgrade and component replacement of communication equipment to address SOGR needs and improve safety and reliability.

Location: NEC wide.

FAST Act Category:
 - Normalized Replacement

Construction Program
 Priority:
 N/A
 Project Benefits:
 - Safety

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101703 Total
\$0	\$0	\$2,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$5,000,000

Communications and Signals Capital Program – NEC Branch Line

C.EN.101770 - HAR LN PARK/ZOO-UPGRADE SIGNAL SYSTEM562

Signal upgrades to address SOGR needs and improve performance and reliability for all users.

Location: Linecode - AH (Harrisburg Line). PRIIA segments 28,29,30.

FAST Act Category:
 - Normalized Replacement
 Also Supports:
 - Backlog Cap. Replacement
 - Improvements to Support Service Enhancements or growth
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
 Priority:
 14
 Project Benefits:
 - SOGR
 - Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101770 Total
\$3,822,104	\$7,490,000	\$7,750,000	\$8,750,000	\$7,250,000	\$6,250,000	\$41,312,104

<p>C.EN.101752 - HARRISBURG LINE FIBER OPTIC SYSTEM UPGRS</p> <p>This project is to upgrade the fiber optic communications core in Philadelphia and Harrisburg to meet the growing demands for higher bandwidth services. The upgrade will be performed in phases to avoid disruption of railroad operations and secure a path forward for any required future upgrades. The current system will remain operational throughout the upgrade process.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Improvements - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - SOGR - Resilience
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Location: Line code - AH. Harrisburg Line. PRIIA segment 28, 29 and 30.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101752 Total
\$1,250,000	\$100,000	\$0	\$0	\$0	\$0	\$1,350,000

<p>C.EN.101607 - SPRINGFIELD LN PTC INSTALLATION WAYSIDE</p> <p>PTC Springfield Line Design - Amtrak is committed to the extension of PTC on the remainder of the main stem and on its tributary routes, including the Springfield Line (New Haven-Springfield).</p> <p>Location: Linecode - AS. PRIIA segment 25.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Safety & Mandates - Strategic Initiatives that improve operational performance, lower cost or improve efficiency - Statutory, regulatory, or other legal mandates 	<p>Construction Program</p> <p>Priority: 15</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101607 Total
\$4,200,000	\$100,000	\$0	\$0	\$0	\$0	\$4,300,000

<p>C.EN.101758 - AMT NATIONAL PTC SPLIT-POINT DERAIL PRGM</p> <p>National PTC SPLIT-POINT DERAIL PROGRAM. These installations will help to prevent rail equipment from entering main line track. The split-point derails will be installed at 19 locations where the main line track speeds are over 90 miles per hour. By FRA Mandate each of these locations will have a Split-Pont Derail with Electrically Locked Hand Thrown switch stand installed.</p> <p>Location: Line code - AH, milepost 35.3 to 104.6. Harrisburg Line. PRIIA segment 30.</p>	<p>FAST Act Category:</p> <ul style="list-style-type: none"> - Safety & Mandates - Strategic Initiatives that improve operational performance, lower cost or improve efficiency - Statutory, regulatory, or other legal mandates 	<p>Construction Program</p> <p>Priority: N/A</p> <p>Project Benefits:</p> <ul style="list-style-type: none"> - Safety - SOGR - Resilience
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FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101758 Total
\$450,000	\$0	\$0	\$0	\$0	\$0	\$450,000

Communications and Signals Capital Program – National Network

C.EN.101684 - AMTRAK NATIONAL COMMUNICATION SYS UPGRS

This National project funds upgrades or replacement of the telecommunication systems on the right of way and in structures.

Location: National Network.

FAST Act Category:

- Normalized Replacement

Also Supports:

- Backlog Cap. Replacement
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program

Priority: 12

Project Benefits:

- Safety
- Journey Time Capability
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101684 Total
\$2,350,000	\$500,000	\$1,500,000	\$1,000,000	\$1,000,000	\$0	\$6,350,000

C.EN.201027 - CHI-HARRISON ST SW MACH UPGR

Address switch machine components not currently in a state of good repair.

Location: National Network - Central Division, Chicago.

FAST Act Category:

- Improvements

Construction Program

Priority: 12

Project Benefits:

- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.201027 Total
\$300,000	\$250,000	\$250,000	\$250,000	\$0	\$0	\$1,050,000

C.EN.101618 - CHI CTRL CENTER HARDWARE-SOFTWARE UPGRS

Replace all ARINC servers with current DELL versions running Windows server 2012. Replace all CISCO equipment. Replace Verint Recorder Server. Replace all User Interface equipment.

FAST Act Category:

- Improvements
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program

Priority: N/A

Project Benefits:

- Safety
- SOGR
- Resilience

RailComm is pleased to provide you with a quote as requested for a upgrading the current network to a redundant communication network. Network A, Network B, Network C, and Network D are currently installed at Amtrak Chicago and will be upgraded with a redundant communication network. For this estimate, RailComm is providing the necessary hardware to update communications network with a redundant automatic failover for the existing four (4) Comm controllers. The existing Comm controllers and associated Office Comm Module's are also being upgraded. RailComm will provide a redundant rack-mount server configuration. The servers will be configured for automatic failover to allow for uninterrupted system operation in the event of a hardware or software failure. Included in the RailComm redundant server setup is one (1) rack, three (3) rack mount servers, two (2) rack mount network switches, a rack mount UPS and power distribution unit, and one (1) rack mount KVM with integrated pullout LCD screen, mouse, and keyboard.

Location: National Network - Central Division, Chicago.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101618 Total
\$200,000	\$0	\$0	\$2,000,000	\$0	\$0	\$2,200,000

C.EN.101682 - AMTRAK NATIONAL C&S INTERLOCKING UPGRS

The scope of this National program is to address interlocking signal system components not currently in a state of good repair. Some of the work performed under this program includes conversion of air switch machines to electric machines, automation of manual towers and replacement of various obsolete interlocking signal system components.

FAST Act Category:

- Improvements
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program

Priority: 9

Project Benefits:

- Safety

Location: National Network.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101682 Total
\$815,000	\$190,000	\$500,000	\$490,000	\$130,000	\$500,000	\$2,625,000

C.EN.101376 - CHICAGO AREA INTERLOCKING C&S UPGRS
Chicago Area Interlockings are becoming functionally obsolete as increases in train traffic and equipment obsolescence have combined to create a situation where failures are hard to troubleshoot. C&S interlocking equipment has reached the end of its life cycle.

Equipment has reached the end of its life cycle and many components are no longer supported by the manufacturer. This makes maintenance difficult and potentially creates situations where long train delays can be expected.

Location: National Network - Central Division - Chicago.

FAST Act Category:
- Improvements

Also Supports:
- Improvements to Support Service Enhancements or growth
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
- SOGR
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101376 Total
\$1,250,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$3,750,000

C.EN.101766 - AMTRAK NATIONAL - C&S NETWORK UPGRADES
Upgrades to the communication and signals network equipment to support the increased demands of both communications and data usage.

Location: National Network.

FAST Act Category:
- Improvements
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Construction Program
Priority:
N/A

Project Benefits:
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101766 Total
\$550,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$1,050,000

C.EN.101432 - CHICAGO-ST. LOUIS LOCOMOTIVE PTC UPGRADE
Illinois HSR PTC - Modify the functionality of locomotives with X-ITCS in Illinois service to develop PTC-capable, high-speed rail service between Chicago and St. Louis.

Location: National Network - Central Division.

FAST Act Category:
- Safety & Mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program
Priority:
N/A

Project Benefits:
- SOGR
- Resilience

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101432 Total
\$343,000	\$0	\$0	\$0	\$0	\$0	\$343,000

C.EN.101435 - PTC CHICAGO TERMINAL - I-ETMS INSTALLATI

This project will provide PTC I-ETMS capability on the Central Division. A Vendor will be contracted to design, implement, test and commission an I-ETMS system at the Chicago and New Orleans Terminal area and obtain FRA certification. In addition this project will upgrade the Signal System in the Chicago I-ETMS territory to a state of good repair. Design of I-ETMS and Signal Upgrade work is minimal. The extent of Amtrak Force Account involvement will be determined once the vendor estimates the level of effort of the work and the availability of Amtrak resources is known. Amtrak and Vendor will jointly Test and Commission the Signal System Upgrades and the I-ETMS system.

FAST Act Category:

- Safety & Mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program

Priority:
N/A

Project Benefits:

- SOGR
- Resilience

Location: National Network - Central Division.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101435 Total
\$2,731,390	\$4,250,000	\$2,075,000	\$0	\$0	\$0	\$9,056,390

C.EN.101760 - CENTRAL DIV PTC SPLIT-POINT DERAIL PRGM

National Central Division PTC SPLIT-POINT DERAIL PROGRAM. These installations will help to prevent rail equipment from entering main line track. The split-point derails will be installed at 5 locations where the main line track speeds are over 90 miles per hour. By FRA Mandate each of these locations will have a Split-Pont Derail with Electrically Locked Hand Thrown switch stand installed.

FAST Act Category:

- Safety & Mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program

Priority:
N/A

Project Benefits:

- Safety
- SOGR
- Resilience

Location: National Network - Central Division.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101760 Total
\$300,000	\$0	\$0	\$0	\$0	\$0	\$300,000

Communications and Signals Capital Program – New York State

C.EN.101468 - EMPIRE CORRIDOR PTC INSTALLATION WAYSIDE

PTC Hudson Line - Amtrak is committed to the extension of PTC on the remainder of the main stem and on its tributary routes, including the Keystone Corridor (Harrisburg-New York) and the Springfield Line (New Haven-Springfield). In addition, agreements will provide for the introduction of ACSES on a portion of the Hudson line, from MP 75.8 to Albany-Rensselaer. I-ETMS will be installed from Albany Rensselaer to the Division post, (Hoffmans) MP. 169.7 PTC on this portion of Amtrak railroad will require 25 million to complete.

FAST Act Category:

- Safety & Mandates
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Statutory, regulatory, or other legal mandates

Construction Program

Priority:
N/A

Project Benefits:
- Resilience

Location: Linecode - MN, milepost 169.7. PRIIA segment 27.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101468 Total
\$5,500,000	\$100,000	\$0	\$0	\$0	\$0	\$5,600,000

Communications and Signals Capital Program – Michigan

C.EN.100100 - MICHIGAN DISTRICT MP192 TO MP2 Upgrade and component replacement of C&S equipment at at-grade crossings.

FAST Act Category:

- Improvements

Construction Program

Priority:
12

Location: National Network - State of Michigan owned.
Linecode - AM (Michigan Line).

Project Benefits:
- Safety
- SOGR
- Journey Time
Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100100 Total
\$1,200,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$2,500,000	\$13,700,000

C.EN.100696 - MICHIGAN LINE MP152-MP158 SIGNAL SYS UPG Signal upgrades to address SOGR needs and improve performance and reliability for all users. Location: National Network - State of Michigan owned. Linecode - AM (Michigan Line).				FAST Act Category: - Improvements Also Supports: - Strategic Initiatives that improve operational performance, lower cost or improve efficiency		Construction Program Priority: N/A Project Benefits: - SOGR - Resilience
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100696 Total
\$3,286,843	\$800,000	\$800,000	\$800,000	\$800,000	\$800,000	\$7,286,843

Communications and Signals Capital Program Other Departments – Significant Projects

C.TR.100088 - HOST RR TERR INSTALL POSITIVE TRAIN CTRL				FAST Act Category: - Host Railroad Capital - Strategic Initiatives that improve operational performance, lower cost or improve efficiency - Improvements to Support Service Enhancements or growth		Construction Program Priority: N/A Project Benefits: - Safety
Installation of Positive Train Control on host railroad infrastructure. This includes upgrades to CIH's, radio transmission equipment, and wayside interface units.						
Location: National Network.						
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.TR.100088 Total
\$0	\$15,428,408	\$6,830,000	\$0	\$0	\$0	\$22,258,408

Appendix I: Unconstrained Infrastructure Capital Investment Program

This section presents the UNCONSTRAINED list of infrastructure capital investments (as of January 2019). Pursuant to 49 U.S.C. § 24320(a)(2) Amtrak may include an appendix to the asset plan that describes any funding needs in excess of amounts authorized or otherwise available to Amtrak in a fiscal year.

Overview

A principle goal of IALP2019 is to begin the implementation of a transition strategy to move to normalized investment levels to maintain SOGR. To achieve this, it is necessary to address the SOGR backlog.

As discussed in the [asset class appendices \(B-F\)](#), the steady state program is estimated at \$1.2 billion annually. This represents a \$0.53 billion increase over the current FY2019 authorized capital plan for infrastructure. (Amtrak received \$0.826 billion for FY19, of which \$0.668 billion is for infrastructure projects) Of note is that steady state maintenance projects accounts for only \$ 0.408 billion of the overall infrastructure investment.

Our analysis also suggests we currently have a \$33.3 billion SOGR backlog for infrastructure – nationally.

Given the advancing age of the infrastructure assets and historical underinvestment, Amtrak Engineering determined the need for a [10-year SOGR backlog reduction program](#). Without a commitment to address the backlog we will face serious operational

constraints in the years ahead as the communication and train control infrastructure will reach the end of its useful life, potentially resulting in degradation of service reliability and significant reduction of capacity.

A 10-year program will require \$3.33 billion per year to begin addressing SOGR backlog. However, this requires additional funding beyond what is currently available. For the 6-year planning period (FY2019 to FY 2024) there is a \$17.6 billion shortfall in funding to begin to address SOGR backlog.

To begin to address both the Steady State shortfall and SOGR backlog, the following sections set out the proposed unconstrained infrastructure capital plans.

It should be noted, that the projects presented here represent what Amtrak consider to be actionable given known access and resource (equipment/ manpower) capacity, and will not fully address the shortfall or backlog discussed in the asset class appendices.

Unconstrained Significant Projects

The following tables set out the full funding requirement for significant projects.

Bridges and Buildings – FY19 to FY24 Unconstrained Significant Projects

Bridges and Buildings Capital Program – Significant Projects- Unconstrained

<p>C.EN.201278 - B&P TUNNEL REPLACEMENT DSN Preliminary Design of the replacement of the John St., Wilson St., and Gilmore St. Tunnels - more commonly referred to as the Baltimore and Potomac Tunnel. This project would replace the aging B&P Tunnel, a key chokepoint where the right-of- way is reduced from four to two tracks and the tunnel's tight curvature require trains to reduce speeds to 30 mph. The existing tunnel is in need of constant monitoring and maintenance at high cost. This project would replace the existing two-track tunnel with a new four-track tunnel (as four single track bores) on an improved alignment. Justification: Built in 1873, the existing two-track tunnel is nearing the end of its useful life. Improvements are required in order to maintain operations through this section of Baltimore and additional tracks are needed to meet future demand.</p>	<p>FAST Act Category: - Improvements</p> <p>Also Supports: - Normalized Capital Replacement - Improvements to Support Service Enhancements or growth - Strategic Initiatives that improve operational performance, lower cost or improve efficiency</p>	<p>Construction Program Priority: N/A</p> <p>Project Benefits: - Safety - SOGR - Resilience</p>
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Location: Linecode - AP, milepost 96.11. John St Tunnel. PRIIA segment 22.

AND

Linecode - AP, milepost 96.60. Wilson St Tunnel. PRIIA segment 22.

AND

Linecode - AP, milepost 97.22. Gilmore St Tunnel. PRIIA segment 22.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.201278 Total
\$10,000,000	\$30,000,000	\$60,000,000	\$180,000,000	\$200,000,000	\$500,000,000	\$980,000,000

C.EN.101004 - MD060.07 SUSQUEHANNA BRIDGE REPLACEMENT

Replacement of the Susquehanna River bridge to address SOGR and to increase capacity necessary for HSR services between Philadelphia and Washington, DC. This project would replace the existing two-track movable Susquehanna River Bridge with two modern highlevel, fixed structures, each with two tracks. The project would benefit commuter and intercity rail as well as Norfolk Southern, which uses the segment to access the Port of Baltimore.

Justification: Built in 1906, the existing two-track bridge is nearing the end of its useful life. The current bridge requires trains to reduce speeds for almost a mile due to its condition. A new asset is required in order to maintain operations through this section of Maryland and additional tracks are needed to meet future demand.

FAST Act Category:
- Major Backlog

Construction Program
Priority:
N/A

Project Benefits:
- Safety
- Journey Time Capability
- SOGR
- Resilience

Location: Linecode - AP, milepost - 60.07. Susquehanna River Bridge. PRIIA segment 22.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101004 Total
\$4,000,000	\$10,000,000	\$20,000,000	\$10,000,000	\$200,000,000	\$400,000,000	\$644,000,000

C.EN.100190 - CT106.89 CONN RV REPL DESIGN
 Design of the replacement or rehabilitation of bridge number 106.89 Connecticut River on the Shore Line, New England Division. This project would replace the Connecticut River Bridge between Old Saybrook and Old Lyme, CT that carries Amtrak and Shore Line East trains. Completed in 1907, it is the oldest movable bridge between New Haven, CT and Boston, MA. The bridge has a movable span that is raised up to allow boats to pass. By law, the bridge must remain open from May through September for recreational boats to pass and closes only when trains approach. Plans would replace the Connecticut River Bridge with a new design that improves reliability and offers higher speeds for Amtrak and Shore Line East trains. FRA completed NEPA and issued a Finding of No Significant Impact (FONSI) for this project in January 2017. Preliminary design is underway, but no funding is available for final design or construction.

Justification: A century of operation in a marine environment, coupled with the age of the structure, has taken its toll and speeds are restricted to 45 mph. Many key elements of the bridge have reached the end of their design life and require extensive maintenance to remain in operable condition. The frequent opening and closing of the bridge – over 3,000 times per year – puts high demands on its aging components, increasing maintenance costs for Amtrak and reducing reliability for both railway and marine traffic.

FAST Act Category:
 - Major Backlog

Construction Program Priority:
 N/A

Project Benefits:
 - Safety
 - Journey Time Capability
 - SOGR
 - Resilience

Location: Linecode - AB, milepost 106.89. Connecticut River Bridge. PRIIA segment 5.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100190 Total
\$2,000,000	\$5,000,000	\$11,000,000	\$5,000,000	\$182,000,000	\$182,000,000	\$387,000,000

C.EN.101192 - BGMS MD072.14 BUSH RIVER BRIDGE - REPLACEMENT BRIDGE DESIGN
 Replace the half-mile long Bush River Bridge connecting Edgewood and Perryman, Maryland that was completed in 1913 and currently carries Amtrak, MARC commuter, and Norfolk Southern freight trains. Planning and design for a replacement bridge would explore constructing a new fixed bridge with enough clearance to allow boats to pass below, significantly improving mobility for both maritime and rail traffic. Planning would also consider options for providing additional capacity for intercity, commuter, and freight railroad operations. Service reliability is under threat due to aging bridge components, which require continued maintenance.

FAST Act Category:
 - Major Backlog
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency

Also Supports:
 - Backlog Capital Replacement

Construction Program
Priority:
 N/A

Project Benefits:
 - Safety
 - Journey Time Capability
 - SOGR
 - Resilience

Location: Linecode - AP, milepost - 71.87. Bush River Bridge. PRIIA segment 22.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101192 Total
\$-	\$-	\$5,000,000	\$25,000,000	\$100,000,000	\$110,000,000	\$240,000,000

C.EN.101193 - BGUG MD078.86 GUNPOWDER RIVER - REPLACEMENT BRIDGE DESIGN
 Replace the Gunpowder River Bridge, an approximately one-mile long crossing between Chase and Joppa, MD. It carries Amtrak, MARC commuter, and Norfolk Southern freight trains. Design options for consideration include a higher-capacity four-track bridge that would increase service potential and reliability for Amtrak, MARC, and freight service. Potential for a separate freight track would also be examined as part of the plan, which would facilitate freight service at all times of day. The existing Gunpowder River Bridge was completed in 1913. Worsening infrastructure conditions have led to more intensive maintenance and costs. Freight trains are restricted to nighttime operations over the bridge, as the two tracks are at capacity during normal passenger rail operating hours.

FAST Act Category:- Major Backlog- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
Also Supports:- Backlog Capital Replacement

Construction Program
Priority:
 N/A
Project Benefits: - Safety- Journey Time Capability- SOGR- Resilience

Linecode - AP, milepost - 78.38. Gunpowder River Bridge. PRIIA segment 22.

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101193 Total
\$-	\$-	\$5,000,000	\$25,000,000	\$100,000,000	\$110,000,000	\$240,000,000

Addressing NEC Network Performance Improvement

The Northeast Corridor (NEC) is one of the most complex and heavily-used railroads in the world. Much of the corridor is not only in need of urgent rehabilitation but is also approaching the limits of its capacity. Addressing the SOGR backlog therefore provides an opportunity to consider network performance needs and ensure that the NEC can continue to provide safe, reliable, and convenient high-speed rail service into the next century and beyond.

Table 79 provides details of priority projects which could be advanced within the next six years should funding become available. The projects identified are consistent with those published recently by the NEC Commission in its Capital Investment Plan¹⁶.

As noted previously, these projects represent an opportunity to improve network performance while addressing needed SOGR backlog. The costs should therefore be considered in addition to the SOGR backlog and steady state requirement.

Table 79: NEC Network Improvement Needs and Priorities

Project Definition	Project Status	FY2019 to FY2024 Funding Requirement	Total Project Funding Requirement	SOGR backlog identified for asset
Baltimore and Potomac Tunnel Replacement Replacement of B&P tunnel with a new four track tunnel and an improved alignment, would both improve reliability and accommodate demand for future train service.	→ The Federal Railroad Administration (FRA), Maryland Department of Transportation (MDOT), City of Baltimore and Amtrak has cooperated on an Environmental Impact Statement (EIS) for a replacement tunnel as required by the National Environmental Policy Act (NEPA). After evaluation of 16 alternatives, including public input, the Record of Decision was released in March 2017 for Selected Alternative 3B that provides: <ul style="list-style-type: none"> ○ A four-track tunnel system, increasing capacity and speeds ○ The best improvements to travel time ○ Accessibility improvements at West Baltimore MARC station ○ Mitigation measures to reduce environmental impacts → Funding is now needed to finish design and start construction of the approximately \$5 billion new tunnel system. Funding will be pursued through a combination of Department of Transportation grant programs, funding for Amtrak and local matches.	\$555M	\$4,520M	\$700M

¹⁶ Northeast Corridor Capital Investment Plan – Fiscal Years 2019-2023. Northeast Corridor Commission, August 2018.

Project Definition	Project Status	FY2019 to FY2024 Funding Requirement	Total Project Funding Requirement	SOGR backlog identified for asset
Susquehanna River Bridge Replacement Replacement of Susquehanna River Bridge with two parallel two-track fixed bridges each high enough to allow boats to pass without opening.	→ Amtrak, the Federal Railroad Administration and Maryland Department of Transportation have cooperated on an Environmental Assessment (EA) for a new replacement bridge, as required by the National Environmental Policy Act (NEPA). After the evaluation and public screening of multiple alternatives, a Finding of No Significant Impact (FONSI) was released in June 2017 for Selected Alternative 9A. The study included preliminary engineering and 30% design which has been advanced in close coordination with the adjacent communities to ensure aesthetic consistency and to respect the historic character of the surrounding area. → Funding is now needed to finish design and construct the estimated \$1.7 billion new bridge. Funding will be pursued through a combination of federal grant programs, funding from Amtrak, and other state and local matches.	\$675M	\$1,700M	\$40M
East River Tunnel Rehabilitation Rehabilitation of all four tunnels. (SEE NOTE 1)	→ Project is awaiting \$750 million in funding for final design and construction of improvements.	\$497M	\$750M	\$5,017M
Pelham Bay Bridge Replacement Replacement with a new high level fixed bridge with clearance for marine traffic.	→ Project is awaiting \$410 million in funding for final design and construction of improvements.	\$170M	\$410M	\$20M
Connecticut River Bridge Replacement Replacement with a new movable bridge.	→ An environmental assessment and preliminary design have been completed, awaiting Federal Railroad Administration approval. Project is awaiting \$660 million in funding for final design and construction of improvements.	\$414M	\$660M	\$20M

Gateway Program

Gateway is a comprehensive program of strategic rail infrastructure improvements designed to improve current services and create new capacity that will allow the doubling of passenger trains running under the Hudson River. The Program is in the planning and design phase and a reliable program cost estimate has not yet been developed. Amtrak has directed more than \$300 million, mostly from federal sources, to the Gateway Program since 2012. This includes approximately \$74 million for planning and pre-construction work and \$235 million to

Project Definition	Project Status	FY2019 to FY2024 Funding Requirement	Total Project Funding Requirement	SOGI backlog identified for asset
<p>the Hudson Yards concrete casing from federal Sandy Resiliency funding under the Disaster Relief Appropriations Act of 2013.</p> <p>Amtrak is an active partner in the Gateway Program Development Corporation, a non-profit organization established in 2016 to effectuate the planning, financing and delivery of the Program. The first phase of the Gateway Program includes the Hudson Tunnel and Portal Bridge Replacement projects.</p>				
<p>Sawtooth Bridge</p> <p>The Sawtooth Bridge carries the NEC over the NJ TRANSIT Morristown Line and the PATH rail line. The bridge is in a state of serious distress and is well beyond possibility of rehabilitation. This project would replace the existing, structurally deficient bridge spans with four-track structures.</p>	<ul style="list-style-type: none"> → Construction staging is complex because of the intensity of use of the NEC as well as intense usage on the railroad crossings below the structures. → Amtrak, is currently progressing the Environmental Assessment (EA) for a new replacement bridge, as required by the National Environmental Policy Act (NEPA). Funding is needed to complete design and construct the estimated the \$1.3 billion new bridge. 	\$1,254M	\$1,300M	\$30M
<p>Portal North Bridge</p> <p>Replacement of Portal Bridge with a new high-level, fixed span bridge that would eliminate future malfunctions.</p>	<ul style="list-style-type: none"> → Fully designed and permitted, early construction work on this project began in the summer of 2017. This work is funded by a TIGER grant to NJ TRANSIT and includes the realignment of a 138 kV transmission pole, the installation of new fiber optic cable poles, the construction of a construction access structure known as a finger pier, the steel bridge structure over the Jersey City Municipal Utility Authority water main, and a retaining wall just west of the Frank R. Lautenberg Station at Secaucus Junction. Funding for approximately 50% of the estimated project cost has been committed by funding partners Amtrak, NJ TRANSIT and the Port Authority of New York & New Jersey (PANYNJ). The project was accepted into the Federal Transit Administration's Capital Investment Grant Project Development pipeline in July 2016. Construction of this nationally significant project can start as soon as a federal financial commitment is in place. → Funding is now needed to complete construction of the estimated \$1.7 billion new Portal North Bridge. 	\$1,298M	\$1,700M	\$20M
<p>Hudson Tunnel Project</p>	<ul style="list-style-type: none"> → The FRA and NJ TRANSIT have prepared an Environmental Impact Statement (EIS) to evaluate the Hudson Tunnel Project. Amtrak, in partnership with the Port Authority of 	\$7,380M	\$12,900M	\$2,699M

Project Definition	Project Status	FY2019 to FY2024 Funding Requirement	Total Project Funding Requirement	SOGR backlog identified for asset
Construction of a new two track tunnel (Hudson Tunnel), to allow for the existing North River Tunnel to be closed for reconstruction.	New York and New Jersey (PANYNJ), is conducting the preliminary engineering. Partners are awaiting a record of decision from the FRA and FTA. Funding is now needed to complete construction of the estimated \$12.9 billion new Hudson Tunnel.			
Total Forecast Network Improvements (unfunded)		\$12,243M	\$23,940M (\$15,395M over SOGR backlog)	

Note: 1. The improvement program is for the rehabilitation of the East River Tunnel. Due to the age of the asset, the SOGR backlog identifies this asset for complete replacement.

FY19 to FY24 Planned Unconstrained Gateway Capital Investments

Gateway Projects

C.EN.101616 - NEW HUDSON RIVER TUNNEL CONSTRUCTION

The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project

- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of the existing North River Tunnel)

Construction Program

Priority:

N/A

Project

Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101616 Total
\$12,500,000	\$105,670,773	\$105,670,773	\$105,670,773	\$105,670,773	\$0	\$435,183,092

C.EN.100507 - NJ007.80&NJ007.96-BRDG CAPACITY UPGR DESIGN
 Bridge capacity upgrade design for Bridge NJ007.80 (crossing NJ Transit lines) and NJ007.96 (crossing PATH and Conrail). Both are I-Beam with concrete slab bridges - constructed in 1910 and are reaching the end of their useful lives.

Location: Line code - AZ, milepost 7.75 and 7.93. PRIIA segment 12.

FAST Act Category:
 Non Re-occurring Project
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency
 - Improvements to Support Service Enhancements or growth

Also Supports:
 - Backlog Capital Replacement

Construction Program Priority:
 N/A

Project Benefits:
 - SOGR
 - Resilience
 - Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100507 Total
\$8,245,000	\$10,000,000	\$10,000,000	\$12,000,000	\$14,000,000	\$20,000,000	\$74,245,000

C.EN.101458 - GATEWAY PROGRAM MANAGEMENT
 Gateway is a comprehensive program of strategic rail infrastructure improvements designed to improve current services and create new capacity that will allow the doubling of passenger trains running under the Hudson River. The program will increase track, tunnel, bridge, and station capacity, eventually creating four mainline tracks between Newark, NJ, and Penn Station, New York, including a new, two-track Hudson River tunnel.

Location: Line Code - AZ (Gateway). PRIIA segment 12.

FAST Act Category:
 Non Re-occurring Project
 - Strategic Initiatives that improve operational performance, lower cost or improve efficiency
 - Improvements to Support Service Enhancements or growth

Also Supports:
 - Backlog Capital Replacement (of existing assets)

Construction Program Priority:
 N/A

Project Benefits:
 - SOGR
 - Resilience
 - Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101458 Total
\$9,627,500	\$20,000,000	\$31,021,446	\$46,200,968	\$46,200,968	\$56,700,968	\$209,751,850

<p>C.EN.101195 - NJ006.10 NEW PORTAL NORTH BR CONSTR</p> <p>Design and construction of the two-track replacement bridge. Portal North Bridge will be designed as a high-level, fixed-span bridge, eliminating the movable components and risk of malfunction.</p> <p>Location: Line code - AZ, milepost 6. PRIIA segment 12.</p>						
				<p><u>FAST Act Category:</u></p> <p>Non Re-occurring Project</p> <ul style="list-style-type: none"> - Strategic Initiatives that improve operational performance, lower cost or improve efficiency - Improvements to Support Service Enhancements or growth <p>Also Supports:</p> <ul style="list-style-type: none"> - Backlog Capital Replacement (of existing assets) 		<p><u>Construction Program</u></p> <p><u>Priority:</u></p> <p>N/A</p> <p><u>Project Benefits:</u></p> <ul style="list-style-type: none"> - SOGR - Resilience - Journey Time Capability
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101195 Total
\$2,285,638	\$13,575,541	\$40,460,354	\$44,960,567	\$29,897,631	\$23,369,245	\$154,548,976
<p>C.EN.100876 - HARRISON NY 4TH TK DESIGN AND INITIATION</p> <p>Design and initiation of capacity improvements in Harrison</p> <p>Location: Line code - AZ, milepost 7 (estimated). PRIIA segment 12.</p>						
				<p><u>FAST Act Category:</u></p> <p>Non Re-occurring Project</p> <ul style="list-style-type: none"> - Strategic Initiatives that improve operational performance, lower cost or improve efficiency - Improvements to Support Service Enhancements or growth 		<p><u>Construction Program</u></p> <p><u>Priority:</u></p> <p>N/A</p> <p><u>Project Benefits:</u></p> <ul style="list-style-type: none"> - SOGR - Resilience - Journey Time Capability
FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100876 Total
\$1,000,000	\$2,000,000	\$2,000,000	\$3,860,000	\$3,860,000	\$3,860,000	\$16,580,000

C.EN.101459 - HUDSON RIVER-CONSTRUCT NEW TUNNELS DESIGN

The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of existing assets)

Construction Program

Priority:

N/A

Project

Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101459 Total
\$25,000,000	\$21,500,000	\$21,500,000	\$21,500,000	\$20,000,000	\$1,500,000	\$111,000,000

C.EN.100879 - GATEWAY PRELIMINARY DESIGN AND PLANNING

Gateway is a comprehensive program of strategic rail infrastructure improvements designed to improve current services and create new capacity that will allow the doubling of passenger trains running under the Hudson River. The program will increase track, tunnel, bridge, and station capacity, eventually creating four mainline tracks between Newark, NJ, and Penn Station, New York, including a new, two-track Hudson River tunnel.

Location: Line Code - AZ (Gateway). PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of existing assets)

Construction Program

Priority:

N/A

Project

Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100879 Total
\$4,000,000	\$5,600,000	\$6,440,000	\$14,000,000	\$17,000,000	\$22,000,000	\$69,040,000

C.EN.101613 - NEW HUDSON RIV TUN PROPERTY ACQUISITION

The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project

- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of existing assets)

Construction

Program

Priority:

N/A

Project

Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101613 Total
\$5,000	\$5,000	\$5,000	\$0	\$0	\$0	\$15,000

C.EN.100878 - CONSTRUCT NEW FIXED PORTAL NORTH BRIDGE

Design and construction of the two-track replacement bridge. Portal North Bridge will be designed as a high-level, fixed-span bridge, eliminating the movable components and risk of malfunction.

Location: Line code - AZ, milepost 6. PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project

- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of existing assets)

Construction

Program

Priority:

N/A

Project

Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100878 Total
\$405,000	\$0	\$0	\$0	\$0	\$0	\$405,000

C.EN.100875 - TUN NY GATEWAY TUNNEL BOX-HUDSON YARDS D

The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of existing assets)

Construction Program

Priority:

N/A

Project

Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.100875 Total
\$1,316,909	\$1,000,000	\$1,000,000	\$1,000,000	\$500,000	\$0	\$4,816,909

C.EN.101164 - HUDSON YD CONSTRUCT TUNNEL BOX SEGMENT 1

The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project
- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of existing assets)

Construction Program

Priority:

N/A

Project

Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.EN.101164 Total
\$5,000,000	\$0	\$0	\$0	\$0	\$0	\$5,000,000

C.SP.100038 - HUDSON RIVER CONSTRUCT NEW TUNNELS NEPA

The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project

- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of existing assets)

Construction

Program

Priority:

N/A

Project

Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.SP.100038 Total
\$2,316,306	\$0	\$0	\$0	\$0	\$0	\$2,316,306

C.SP.10003X - HUDSON PROPERTY ACQUISITION RESERVE

The Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River rail crossing between New Jersey and New York and strengthen the resiliency of the NEC. The preferred alternative is to construct a new rail tunnel beneath the Hudson River, including tracks and other railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River, referred to as the North River Tunnel.

Location: Line code - AZ, milepost 1.68 (North River Tunnel). PRIIA segment 12.

FAST Act Category:

Non Re-occurring Project

- Strategic Initiatives that improve operational performance, lower cost or improve efficiency
- Improvements to Support Service Enhancements or growth

Also Supports:

- Backlog Capital Replacement (of existing assets)

Construction

Program

Priority:

N/A

Project

Benefits:

- SOGR
- Resilience
- Journey Time Capability

FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	C.SP.10003X Total
\$0	\$107,850,000	\$0	\$0	\$0	\$0	\$107,850,000



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